Operation Environmental Management Plan

Orange Raw Water Supply System

ORANGE CITY COUNCIL
## Revision History

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| 2.2     | 22/09/16      | • EPL10263 revoked  
• DSEWPC approval requirements added  
• Changes to operational noise and vibration review  
• Minor edits | M Haege/Geolyse |
| 3.0     | 15/06/18      | Updated OEMP to address actions identified in the Internal Compliance Audit | M Haege/Geolyse |
ABBREVIATIONS

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<tr>
<td>AEMP</td>
<td>Aquatic Environmental Monitoring Program</td>
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<tr>
<td>AHD</td>
<td>Australian height datum</td>
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<tr>
<td>AMS</td>
<td>Adaptive management strategy</td>
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<td>ANZECC</td>
<td>Australian and New Zealand Environment and Conservation Council</td>
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<td>ARMCANZ</td>
<td>Agriculture and Resource Management Council of Australia and New Zealand</td>
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<tr>
<td>BSCSHS</td>
<td>Blackmans Swamp Creek stormwater harvesting scheme</td>
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<tr>
<td>CCS</td>
<td>Community communication strategy</td>
</tr>
<tr>
<td>CTF</td>
<td>Cease to flow</td>
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<tr>
<td>CoA</td>
<td>Condition of approval</td>
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<tr>
<td>DEE</td>
<td>Department of Environment and Energy</td>
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<tr>
<td>DST</td>
<td>Decision Support Tool</td>
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<tr>
<td>DP&amp;E</td>
<td>Department of Planning and Environment</td>
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<tr>
<td>DPI</td>
<td>Department of Primary Industries</td>
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<tr>
<td>DSEWPC</td>
<td>Department of Sustainability, Environment, Water, Population and Communities (now DEE)</td>
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<tr>
<td>EA</td>
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<tr>
<td>EP&amp;A Act</td>
<td>NSW Environmental Planning and Assessment Act 1979</td>
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<tr>
<td>GL</td>
<td>Gigalitre (1,000 megalitres)</td>
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<td>GMP</td>
<td>Groundwater monitoring program</td>
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<td>ha</td>
<td>Hectares</td>
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<td>HMP</td>
<td>Hydrology monitoring program</td>
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<tr>
<td>IMP</td>
<td>Inspection and maintenance plan</td>
</tr>
<tr>
<td>kL</td>
<td>Kilolitre (1,000 litres)</td>
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<td>km</td>
<td>Kilometre (1,000 metres)</td>
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<td>kWhr</td>
<td>Kilowatt hour</td>
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<tr>
<td>L</td>
<td>Litre (1,000 millilitres)</td>
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<td>LGA</td>
<td>Local Government Area</td>
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<td>L/s</td>
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<td>mm</td>
<td>Millimetre</td>
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<td>MOP</td>
<td>Macquarie River to Orange pipeline</td>
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OCC  Orange City Council
OEMP  Operation Environmental Management Plan
PA   Project approval
PCSHS  Ploughmans Creek stormwater harvesting scheme
ScWMP  Scour water management plan
SEP  Stakeholder engagement plan
STP  Sewage treatment plant
µg/L  Micrograms per litre
µS/cm  Micro Siemens per centimetre
WAL  Water access licence
WFP  Water filtration plant
WSP  Water sharing plan
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Scour Water Management Plan

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Training Register

ATTACHMENT M
Agency Consultation

ATTACHMENT N
OCC Incident Management Procedures
Background

1.1 INTRODUCTION

This Operation Environmental Management Plan (OEMP) has been prepared by Orange City Council (OCC) for the Orange raw water supply system. The OEMP includes:

- Spring Creek and Suma Park Dams;
- The Blackmans Swamp Creek stormwater harvesting scheme (BSCSHS);
- The Ploughmans Creek stormwater harvesting scheme (PCSHS);
- Water supply bores; and
- The Macquarie River to Orange pipeline (MOP).

1.2 OEMP OBJECTIVE

The objective of this OEMP is to provide a documented system that will help ensure environmental requirements and commitments made during the approvals process and conditions in other relevant licences and approvals are being implemented, monitored and reviewed when operating the Orange raw water supply system.

1.3 PROJECT DESCRIPTION

1.3.1 LOCATION

The existing OCC raw water supply system consists of the following elements:

- Surface water catchments and the main reservoirs formed by Gosling Creek, Spring Creek and Suma Park Dams;
- The Blackmans Swamp Creek stormwater harvesting scheme – currently approved to operate whenever the level in Suma Park reservoir is below 100%;
- The Ploughmans Creek stormwater harvesting scheme – currently approved to operate whenever the level in the stormwater harvesting holding pond is below 100%;
- The Macquarie River to Orange Pipeline – currently approved to transfer 12 ML/day whenever the level in Suma Park reservoir is below 90% and the flow in the Macquarie River at the offtake point is greater than 108 ML/day (the 12/108/90 operating rule); and
- Groundwater bores at the Showground, Margaret Street Depot and Clifton Grove (Shearing Shed and Bore No. 5).

Elements of the Orange raw water supply system are shown schematically in Figure 1.
Figure 1: Orange Raw Water Supply System

The physical relationship between each element is shown in Figures 2 – Orange Raw Water System Catchment Setting and Figure 3 – Orange Raw Water System.
Figure 2: Orange Raw Water System Catchment Setting

Legend

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<td>Summer Hill Creek System</td>
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<td>Ploughmans Creek</td>
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<td>Rifle Range Creek</td>
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Pump Stations

Macquarie-Orange Pipeline

0  5  10 km
Figure 3: Orange Raw Water System
1.3.2 OPERATIONAL ACTIVITIES

1.3.2.1 Operating Regime

The existing raw water supply provides water security for around 50 years for Orange.

The volume of water supplied by any of the sources will vary from year to year depending on demand (which is influenced by climate, demand management measures and population), climate and how each particular water source is performing. Operation of the water supply system will therefore be dynamic and will vary from year to year depending on these factors.

Furthermore, predicting climate sequences into the future is uncertain, so operation of the system takes on a risk management approach. That is, as the system enters a drought period, it is not possible to predict with certainty how bad that drought sequence will be. Keeping the system storage fuller using external sources (bores, harvesting and the Macquarie River) reduces the risk of running out of water through an extended drought. The trade off with this risk management approach is that when drought breaking catchment inflows occur, less volume is required to fill the storage, resulting in a greater spill volume in that event. Less of the natural catchment runoff is captured.

Therefore, a key component of this OEMP is a Decision Support Tool (DST) which provides a set of integrated operating rules for management and optimisation of the overall Orange raw water supply system.

1.3.2.2 Operating Rules

Application of the DST for any particular water year will define a set of operational rules that will apply for that water year. These rules will vary from year to year in response to conditions. However, none of external water sources (stormwater harvesting, bores and MOP) will be operated outside of their respective approved or licensed operating rules which are defined in the following documents:

- Water Access Licence (WAL) 36161 issued under the Water Management Act 2000 – Suma Park Dam, Spring Creek Dam and BSCSHS. Includes rules for environmental flow releases from Suma Park Dam.
- 80SL096299 issued under the Water Act 1912 – these licences contain operating conditions for the BSCSHS that remain in force until these conditions are converted to the Water Management Act 2000.
- WAL 33891 issued under the Water Management Act 2000 – Ploughmans Creek stormwater harvesting scheme.
- WAL 30283 issued under the Water Management Act 2000 – Clifton Grove bores (Shearing Shed and Bore no. 5).
- 80BL245800 and 80BL245805 issued under the Water Act 1912 – these licences contain operating conditions for the Shearing Shed and Bore no. 5 that remain in force until these conditions are converted to the Water Management Act 2000.
• WAL 29148 issued under the *Water Management Act 2000* – Showground and Margaret Street Depot Bore.

• 80BL245074 and 80BL245947 issued under the *Water Act 1912* – these licences contain operating conditions for the Showground and Margaret Street Depot Bore that remain in force until these conditions are converted to the *Water Management Act 2000*.

• WAL 36374 issued under the *Water Management Act 2000* – water share from the unregulated Macquarie river above Burrendong Dam water source.

• Project Approval MP10_0235 issued 18 June 2013 for the MOP.

• Approval EPBC 2011/6202 issued 19 August 2013 for construction of a pipeline from the Macquarie River to the City of Orange, NSW.
1.4 OEMP CONTEXT

1.4.1 STARTING PREMISE

The starting point for the OEMP is that all construction and commissioning activities are complete and that all actions required by the Construction Environmental Management Plan (CEMP) have been completed and signed off as required.

1.4.2 OPERATING PREMISE

The operating premise is that all external water supply sources (harvesting, bores and MOP) have been assessed and approved based on defined upper operating rules. Environmental assessment of these schemes has found no significant environmental impact when operating in accordance with these rules.

The operating rules are reflected in licence and approval conditions and represent the upper limit of operation of the external water sources. Operating the external water sources within these upper limits in accordance with the Decision Support Tool in the OEMP will therefore not require any change to licence or approval conditions.

1.4.3 TIMING

This OEMP, and evidence of requisite agency consultation (refer Section 1.4.4 – Agency Consultation), must be submitted for the approval of the Director-General prior to the commencement of operation of the project.

Operation of the MOP cannot commence until written approval has been received from the Director-General.

1.4.4 AGENCY CONSULTATION

Agency consultation, as part of the OEMP, should be limited to that required by specific conditions or to clarify specific issues.

The Project Approval Condition of Approval (CoA) D2 requires that the OEMP be prepared in consultation with Office of Environment and Heritage (OEH) and Department of Primary Industries (DPI), as relevant.

CoA B1 requires that the Aquatic Environment Monitoring Program be prepared in consultation with DPI (Water and Fisheries) and OEH as relevant.

CoA B3 requires that the Decision Support Tool be prepared in consultation with DPI (Water) and the Dams Safety Committee as relevant.

Evidence of agency consultation is provided in Attachment M: Agency Consultation.
1.5 SCOPE AND FORMAT OF OEMP

1.5.1 PROJECT APPROVAL

The scope of the OEMP is specified in the Project Approval. Specifically CoA D2 states:

D2. Prior to the commencement of operation, or as otherwise agreed by the Director General, the Proponent shall prepare and implement (following approval) an Operation Environmental Management Plan for the project. The plan shall outline the environmental management practices and procedures that are to be followed during operation, and shall be prepared in consultation with OEH and DPI and in accordance with the Guideline for the Preparation of Environmental Management Plans (Department of Infrastructure, Planning and Natural Resources 2004). In addition, the Plan shall include reference to the Orange Water Supply System Decision Support Tool in condition B3 and an Adaptive Management Strategy (AMS) to manage impacts from the operation of the Project identified through the Aquatic [Environment] Monitoring Program in condition B1.

1.5.2 OEMP SCOPE

The OEMP covers the raw water supply system including:

- Spring Creek and Suma Park Dams;
- The Blackmans Swamp Creek stormwater harvesting scheme (BSCSHS);
- The Ploughmans Creek stormwater harvesting scheme (PCSHS);
- Water supply bores; and
- The Macquarie River to Orange pipeline (MOP).

The OEMP does not address management of the biodiversity offset required under approval EPBC 2011/6202.

1.5.3 STRUCTURE OF OEMP

To facilitate approval the structure, format and scope of this OEMP has been prepared cognizant of the Guideline for the Preparation of Environmental Management Plan (DIPNR, 2004).

To this end, it is noted that this Guideline is not prescriptive, but provides a broad framework and direction. The application of the Guideline requires tailoring to ensure it is project and site specific.
Environmental Management

2.1 ENVIRONMENTAL POLICY

Orange City Council is committed to the protection and enhancement of environmental values which will be achieved through:

- due diligence throughout the environmental assessment process;
- compliance with all statutory obligations, approvals and commitments; and
- a commitment to continual improvement of environmental management systems to enhance environmental performance.

2.2 STRUCTURE AND RESPONSIBILITY

The organisational structure for the Orange raw water supply system is shown in Figure 4.

![Diagram of Orange raw water supply management structure]

**Figure 4:** Orange raw water supply management structure
Key responsibilities and accountabilities for environmental management of the Orange raw water supply system are summarised in the responsibility matrix in Table 2.1.

### Table 2.1 – Responsibility matrix

<table>
<thead>
<tr>
<th>Responsibility</th>
<th>GM</th>
<th>DTS</th>
<th>DAO</th>
<th>WSSM</th>
<th>WTM</th>
<th>AC</th>
<th>WSE</th>
<th>AE</th>
<th>WCC</th>
<th>WTS</th>
<th>TL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corporate environmental management</td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>OEMP implementation and effectiveness</td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>OEMP audit</td>
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<td></td>
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<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Reporting/records</td>
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<td>✓</td>
<td>✓</td>
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<tr>
<td>Community liaison</td>
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<td>Environmental awareness/training</td>
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</tr>
<tr>
<td>Operational control</td>
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<td>✓</td>
</tr>
<tr>
<td>Non-conformance/corrective actions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td>✓</td>
</tr>
<tr>
<td>Compliance with legal &amp; other requirements</td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Point of emergency contact</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>

### 2.3 APPROVALS AND LICENSING

All relevant approvals and licences are contained in OCC’s Raw Water System Licences and Approvals folder. Copies of this folder are held by the:

- Water and Sewerage Strategic Manager (WSSM);
- Water Treatment Manager (WTM);
- Water Compliance Coordinator (WCC);
- Water and Sewer Engineer (WSE); and
- Water Treatment Supervisor (WTS).

The WCC shall be responsible for keeping this folder up to date and its contents shall be reviewed as part of the annual review (refer to Section 4.4.3 – Annual Review).
2.3.1 WATER ACCESS LICENCES

A summary of approvals under the Water Management Act 2000 that apply to the raw water supply system are listed in Table 2.1.

Table 2.1 – Summary of approvals

<table>
<thead>
<tr>
<th>Source</th>
<th>Licence/Approvals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catchment – Spring Creek Dam and Suma Park Dam</td>
<td>WAL36161</td>
</tr>
<tr>
<td></td>
<td>80CA722752</td>
</tr>
<tr>
<td>BSC Stormwater Harvesting</td>
<td>WAL36161</td>
</tr>
<tr>
<td></td>
<td>80WA723739</td>
</tr>
<tr>
<td></td>
<td>80WA723740</td>
</tr>
<tr>
<td></td>
<td>80SL096299(1)</td>
</tr>
<tr>
<td>PC Stormwater Harvesting</td>
<td>WAL33891</td>
</tr>
<tr>
<td></td>
<td>80CA718056</td>
</tr>
<tr>
<td>Bores – Showground/Margaret Street Depot</td>
<td>WAL92148</td>
</tr>
<tr>
<td></td>
<td>80CA715359</td>
</tr>
<tr>
<td></td>
<td>80BL245074(1)</td>
</tr>
<tr>
<td></td>
<td>80BL245947(1)</td>
</tr>
<tr>
<td>Bores – Clifton Grove (Shearing Shed and Bore no. 5)</td>
<td>WAL32083</td>
</tr>
<tr>
<td></td>
<td>80CA715992</td>
</tr>
<tr>
<td></td>
<td>80BL245800(1)</td>
</tr>
<tr>
<td></td>
<td>80BL245805(1)</td>
</tr>
<tr>
<td>Macquarie River to Orange Pipeline</td>
<td>Project Approval(2)</td>
</tr>
<tr>
<td></td>
<td>MP10_0235</td>
</tr>
<tr>
<td></td>
<td>18 June 2013</td>
</tr>
<tr>
<td>Macquarie River above Burrendong water source</td>
<td>WAL 36374</td>
</tr>
</tbody>
</table>

(1) Conditions from the surface licence issued under the Water Act 1912 apply until such time that they are converted to the Water Management Act 2000

(2) The Macquarie River to Orange Pipeline approved by the Minister of Planning therefore no works approval issued. Pipeline to be operated in accordance with the Project Approval.

2.3.2 PROJECT APPROVAL

Project Approval MP10_0235 for the Macquarie River to Orange Pipeline was issued 18 June 2013.

2.3.3 COMMONWEALTH APPROVAL

Approval under section 130(1) and 133 of the Environmental Protection and Biodiversity Act 1999 was issued by the Department of Sustainability, Environment, Water, Population and Communities on 19 August 2013 (EPBC 2011/6202).

2.4 REPORTING

Reporting will be completed in accordance with the OEMP sub-plans.
The principal reporting mechanism will be the Annual Review prepared in accordance with CoA C5 and submitted each year on 1 September (refer to Section 4.4 – OEMP Reporting).

The Annual Review shall include any sub-plan reports.

2.5 ENVIRONMENTAL TRAINING

All staff and contractors involved with the management and operation of the Orange raw water supply system will undergo an environmental due diligence induction session. This induction will focus on responsibilities and obligations under this OEMP.

This provides increased certainty that, coupled with experienced management and supervisory staff, raw water supply operations:

- will be carried out in a competent manner; and
- that the operational staff will have a sound understanding of the environmental context within which they perform their duties and discharge their obligations with respect to environmental good practice.

An environmental due diligence training register will be maintained that requires sign-off by all attendees (Attachment L: Training Register).

2.6 EMERGENCY CONTACTS AND RESPONSE

2.6.1 CONTACTS

The Water and Sewerage Strategic Manager is the nominated contact person for emergencies, and will be available 24 hours a day, seven days a week, with the authority to stop or direct operations as required.

Contact details are provided in Table 2.2.

<table>
<thead>
<tr>
<th>Contact</th>
<th>Phone Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water and Sewerage Strategic Manager</td>
<td>6393 8000</td>
</tr>
<tr>
<td>24 hour line</td>
<td>1300 650 511</td>
</tr>
</tbody>
</table>

2.6.2 RESPONSE

As defined in Department of Infrastructure, Planning and Natural Resource’s EMP guidelines, an environmental emergency is any event that causes or has the potential to cause material harm to the environment.

The procedure to be implemented in the event of an environmental emergency is specified in Section 3.2.18 – Environmental Incident Management noting that this procedure will not override any emergency service direction given at the time of an emergency.
3.1 RISK ASSESSMENT

This section of the OEMP identifies potential environmental impacts associated with operating the Orange raw water supply system. Potential impacts have been identified through consideration of the activities to be undertaken, as well as issues identified in the environmental impact assessment, as well as matters raised by stakeholders during the approvals process.

These potential impacts are treated as risks that need to be managed through environmental management activities, controls and monitoring designed to prevent or minimise these risks being realised.

Attachment A: Risk Management contains a list of potential environmental risks associated with the operation of the Orange raw water supply system and how they will be managed.

The following sections specify the environmental management activities, mitigation and control measures that will be used to prevent or minimise environmental risks and impacts.
3.2 ENVIRONMENTAL MANAGEMENT ACTIVITIES AND CONTROLS

3.2.1 EXTRACTION VOLUME

Potential Impacts
Exceed water share listed on the Water Access Licences.

Operational Objective
Ensure annual water extraction complies with limits and conditions included on Council’s Water Access Licences.

Performance Criteria
- Compliance with Project Approval MP10_0235
- Compliance with WAL 36161
- Compliance with WAL 33891
- Compliance with WAL 30283
- Compliance with WAL 29148
- Compliance with WAL 36374

Management Strategies
Operate in accordance with the following Sub-Plans:
- Attachment C: Decision Support Tool
- Attachment E: Hydrology Monitoring Program

- Effective management of water assignments from WAL 36161 to WAL 36374 as part of the DST.
- OCC purchase of additional water access licences (if available) in the Macquarie River above Burrendong water source.

Monitoring
Monitor in accordance with the following Sub-Plans:
- Attachment E: Hydrology Monitoring Program

Reporting
Data and compliance reported in:
- Annual Review – refer to Section 4.4 – OEMP Reporting.
- Attachment H: Stakeholder Engagement Plan access to information.

Corrective Action
Adaptive Management Strategy
Comply with AMS, refer to Attachment I: Adaptive Management Strategy.
3.2.2 OPERATING RULES

Potential Impacts
Departure from approved operating conditions causing changes to creek and river flow regimes that are different to the predictions made in the assessment documents.

Operational Objective
To operate the raw water system in accordance with all relevant licences, approvals and operating rules.

Performance Criteria
- Compliance with Project Approval MP10_0235
- Compliance with WAL 36161 and associated surface licence 80SL096299
- Compliance with WAL 33891
- Compliance with WAL 30283 and associated bore licences 80BL245800 and 80BL245805
- Compliance with WAL 29148 and associated bore licences 80BL245074 and 80BL245947

Management Strategies
Operate in accordance with the following Sub-Plans:
- Attachment C: Decision Support Tool
- Attachment E: Hydrology Monitoring Program

Monitoring
Monitor in accordance with the following Sub-Plans:
- Attachment C: Decision Support Tool
- Attachment D: Aquatic Environment Monitoring Program
- Attachment E: Hydrology Monitoring Program

Reporting
Data and compliance reported in:
- Attachment C: Decision Support Tool Yearly Water Analysis and Quarterly Review.
- Annual Review – refer to Section 4.4 – OEMP Reporting.
- Attachment H: Stakeholder Engagement Plan access to information.

Corrective Action
Adaptive Management Strategy (AMS)
Comply with AMS, refer to Attachment I: Adaptive Management Strategy.
3.2.3 GAUGING STATIONS

Potential Impacts
Gauging stations do not accurately reflect flow and incorrectly trigger harvest operations. Hydrology data not collected for analyses and reporting.

Operational Objective
Ensure main gauging stations are adequately maintained and accurately rated. Main gauging stations are:

- 421192 – Macquarie River Downstream of Long Point (pump offtake point)
- 421185 – Summer Hill Creek at Icely Road
- 421197 – Summer Hill Creek at Third Crossing bridge
- 421051 – Blackmans Swamp Creek at the Sewage Treatment Plant (STP) gauge
- 421186 – Ploughmans Creek gauging station at North Orange 1 Sewage Pump Station

Performance Criteria
- Compliance with Project Approval MP10_0235
- Hydrometric service agreement in place with DPI Water
- At least four (4) stream gauging undertaken each year and rating curves adjusted as required
- 95% data capture

Management Strategies
Operate in accordance with the following Sub-Plans:
- Attachment E: Hydrology Monitoring Program

Monitoring
Monitor in accordance with the following Sub-Plans:
- Attachment E: Hydrology Monitoring Program

Reporting
Data and compliance reported in:
- Annual Review – refer to Section 4.4 – OEMP Reporting.
- Attachment H: Stakeholder Engagement Plan access to information.

Corrective Action
Adaptive Management Strategy (AMS)
Comply with AMS, refer to Attachment I: Adaptive Management Strategy.
3.2.4 WATER QUALITY

Potential Impacts
- Deterioration of surface and/or groundwater quality
- Impact on aquatic habitat
- Impact on raw water quality in Suma Park Dam that compromises drinking water quality

Operational Objective
No detrimental water quality impact to surface and groundwater resources during operation of the raw water supply scheme.

Performance Criteria
- Compliance with OCC’s Drinking Water Management System

Management Strategies
Operate in accordance with the following Sub-Plans:
- Attachment C: Decision Support Tool
- Attachment D: Aquatic Environment Monitoring Program
- Attachment F: Scour Water Management Plan
- Attachment J: Groundwater Monitoring Program

Operational Controls
- Turbidity monitoring at the Macquarie River Pump Station 1. Cease pumping if turbidity greater than 60 NTU.
- Turbidity logging at Macquarie River Pump Station 1 shall commence 15 minutes before Pump Station 1 starts and cease when Pump Station 1 stops.
- Operation of stormwater harvesting batch ponds to ensure water quality targets are met.
- Groundwater quality monitoring in accordance with Attachment J: Groundwater Monitoring Program.

Monitoring
Monitor in accordance with the following Sub-Plans:
- Attachment D: Aquatic Environment Monitoring Program
- Attachment F: Scour Water Management Plan
- Attachment J: Groundwater Monitoring Program
Reporting

Data and compliance reported in:

- Annual Review – refer to Section 4.4 – OEMP Reporting.

Corrective Action

Adaptive Management Strategy (AMS)

Comply with AMS, refer to Attachment I: Adaptive Management Strategy.
3.2.5 AQUATIC ECOLOGY

**Potential Impacts**
- Alteration to feeding and spawning habitats
- Entrainment during operation of the offtake
- Indirect impacts to habitat as a result of any changes in water quality and flow

**Operational Objective**
To operate the raw water system to minimise impacts to aquatic ecology and provide environmental flow releases to maintain or enhance the key values of water quality, aquatic biodiversity, river health and general ecological condition of Summer Hill Creek.

**Performance Criteria**
- Compliance with Project Approval MP10_0235
- Compliance with approval EPBC 2011/6202
- Compliance with WAL36161
- Compliance with statement of approval 80CA722752

**Management Strategies**
Operate in accordance with the following Sub-Plans:
- Attachment C: Decision Support Tool
- Attachment D: Aquatic Environment Monitoring Program
- Attachment E: Hydrology Monitoring Program

**Monitoring**
Monitor in accordance with the following Sub-Plans:
- Attachment D: Aquatic Environment Monitoring Program

**Reporting**
Data and compliance reported in:
- Annual Review – refer to Section 4.4 – OEMP Reporting

**Corrective Action**
Adaptive Management Strategy (AMS)
Comply with AMS, refer to Attachment I: Adaptive Management Strategy.
3.2.6 ENVIRONMENTAL FLOW RULES

Potential Impacts
Degradation of aquatic ecosystem in Summer Hill Creek

Operational Objective
To operate the raw water supply system in accordance with approved environmental flow rules.

Performance Criteria
- Compliance with WAL36161
- Compliance with statement of approval 80CA722752

Management Strategies
Operate in accordance with the following Sub-Plans:
- Attachment E: Hydrology Monitoring Program

Monitoring
Monitor in accordance with the following Sub-Plans:
- Attachment D: Aquatic Environment Monitoring Program
- Attachment E: Hydrology Monitoring Program

Reporting
Data and compliance reported in:
- Attachment E: Hydrology Monitoring Program
- Annual Review – refer to Section 4.4 – OEMP Reporting

Corrective Action
Adaptive Management Strategy (AMS)
Comply with AMS, refer to Attachment I: Adaptive Management Strategy.
3.2.7 GROUNDWATER MANAGEMENT

Potential Impacts
Deterioration of groundwater levels and/or quality

Operational Objective
To operate the raw water system in accordance with all relevant licences, approvals and operating rules to minimise impacts to groundwater resources.

Performance Criteria
- Compliance with WAL 30283 and associated bore licences 80BL245800 and 80BL245805
- Compliance with WAL 29148 and associated bore licences 80BL245074 and 80BL245947

Management Strategies
Operate in accordance with the following Sub-Plans:
- Attachment C: Decision Support Tool
- Attachment E: Hydrology Monitoring Program
- Attachment J: Groundwater Monitoring Program

Monitoring
Monitor in accordance with the following Sub-Plans:
- Attachment E: Hydrology Monitoring Program
- Attachment J: Groundwater Monitoring Program

Reporting
Data and compliance reported in:
- Attachment E: Hydrology Monitoring Program
- Attachment J: Groundwater Monitoring Program
- Annual Review – refer to Section 4.4 – OEMP Reporting

Corrective Action
Adaptive Management Strategy (AMS)
Comply with AMS, refer to Attachment I: Adaptive Management Strategy.
3.2.8 TERRESTRIAL ECOLOGY

**Potential Impacts**
- Downslope or downstream sedimentation of habitats.
- Modification of vegetation composition in the long-term, if releases occur periodically.
- Modification to vegetation composition along pipeline routes.

**Operational Objective**
To operate and manage the raw water system to minimise impact to terrestrial ecology.

**Performance Criteria**
- Compliance with Project Approval MP10_0235.
- Compliance with OEMP

**Management Strategies**
Operate in accordance with the following Sub-Plans:
- Attachment F: Scour Water Management Plan
- Attachment G: Inspection and Maintenance Plan

**Monitoring**
Monitor in accordance with the following Sub-Plans:
- Attachment G: Inspection and Maintenance Plan

**Reporting**
Data and compliance reported in:
- Annual Review – refer to Section 4.4 – OEMP Reporting

**Corrective Action**
Adaptive Management Strategy (AMS)
Comply with AMS, refer to Attachment I: Adaptive Management Strategy.
3.2.9 STAKEHOLDER ENGAGEMENT

Potential Impacts
Misinformation in the community relating to raw water management.

Operational Objective
To ensure effective stakeholder engagement and access to information for the operation of the Orange City Council raw water supply system.

Performance Criteria
- Compliance with Project Approval MP10_0235.
- Compliance with EA Rule 9 for Blackmans Swamp Creek Stormwater Harvesting Scheme.
- Compliance with EA Rule 4 for Ploughmans Creek Stormwater Harvesting Scheme.
- OCC commitment from NSW Civil and Administrative Tribunal Proceeding No 10/03573 (requirement for a Stakeholder Reference Group).

Management Strategies
Operate in accordance with the following Sub-Plans:
- Attachment H: Stakeholder Engagement Plan including the Community Communication Strategy.

Monitoring
Monitor in accordance with the following Sub-Plans:
- Attachment H: Stakeholder Engagement Plan

Reporting
Data and compliance reported in:
- Annual Review – refer to Section 4.4 – OEMP Reporting

Corrective Action
Adaptive Management Strategy (AMS)
Comply with AMS, refer to Attachment I: Adaptive Management Strategy.
3.2.10 AIR QUALITY

Potential Impacts
Infrequent impacts to air quality due to dust generation from maintenance crews traversing unsealed roads and pipeline easements.

Operational Objective
To operate and manage the raw water system to minimise the potential for air emissions.

Performance Criteria
No air quality complaints relating to the operation of the raw water supply system.

Management Strategies
Operate in accordance with the following Sub-Plans:
• Attachment G: Inspection and Maintenance Plan

Monitoring
Air quality will be monitored by recording air quality complaints. Refer to Section 3.2.17 – Complaints Management.

Reporting
Data and compliance reported in:
• Annual Review – refer to Section 4.4 – OEMP Reporting

Corrective Action
Adaptive Management Strategy (AMS)
Comply with AMS, refer to Attachment I: Adaptive Management Strategy.
3.2.11 NOISE AND VIBRATION

Potential Impacts  Noise due to operation of pumping stations and ancillary services.

Operational Objective  To operate the raw water supply system to minimise noise and vibration.

Performance Criteria  No noise and/or vibration complaints relating to the operation of the raw water supply system.

Management Strategies  Operate in accordance with the following Sub-Plans:
- Attachment C: Decision Support Tool
- Attachment G: Inspection and Maintenance Plan
- Attachment K: Management Studies

Project Approval
CoA D1 – Operational Noise and Vibration Review – deferred, refer to Attachment M: Agency Consultation.

If required (see below) the scope is outlined in Attachment K: Management Studies.

DP&E Letter Dated 1 April 2015
The Water and Sewerage Strategic Manager shall notify the DP&E:
- Upon receipt of any operational noise complaint and subsequent investigation to determine if the complaint was related to the operation of the Macquarie River to Orange pipeline; and
- Advise the timeframe for completion of the Operational Noise and Vibration Review should the complaint be related to operation of the Macquarie River to Orange pipeline and noise monitoring is required. The scope of this review is outlined in Attachment K: Management Studies.

Monitoring
Project Approval
Operational noise and vibration will be monitored by recording complaints. Refer to Section 3.2.17 – Complaints Management.
Reporting

Data and compliance reported in:
- Annual Review – refer to Section 4.4 – OEMP Reporting.

Corrective Action

Adaptive Management Strategy (AMS)
Comply with AMS, refer to Attachment I: Adaptive Management Strategy.
3.2.12 LAND USE

Potential Impacts
Decreased development potential of land within the easement due to restrictions included in the acquisition agreement between Landowners and Council.

Operational Objective
To operate and manage the raw water system to minimise impacts on land use.

Performance Criteria
No complaints relating to restrictions and/or impact on land use.

Management Strategies
Operate in accordance with the following Sub-Plans:
- Attachment G: Inspection and Maintenance Plan

**Signage**
The Macquarie River to Orange pipeline will be signposted to ensure that the landowners are aware of the presence of the pipeline.

**Monitoring**
Monitor in accordance with the following Sub-Plans:
- Attachment G: Inspection and Maintenance Plan

Land use impacts will be monitored by recording complaints. Refer to Section 3.2.17 – Complaints Management.

**Reporting**
Data and compliance reported in:
- Annual Review – refer to Section 4.4 – OEMP Reporting.

**Corrective Action**
Adaptive Management Strategy (AMS)
Comply with AMS, refer to Attachment I: Adaptive Management Strategy.
3.2.13 TRAFFIC MANAGEMENT

Potential Impacts
Minor traffic and road network impacts from operational traffic.

Operational Objective
To operate and manage the raw water system to minimise impacts on the road network and traffic.

Performance Criteria
No complaints related to traffic.

Management Strategies
Operate in accordance with the following Sub-Plans:
- Attachment G: Inspection and Maintenance Plan

Monitoring
Monitor in accordance with the following Sub-Plans:
- Attachment G: Inspection and Maintenance Plan
Traffic management will be monitored by recording traffic complaints. Refer to Section 3.2.17 – Complaints Management.

Reporting
Data and compliance reported in:
- Annual Review – refer to Section 4.4 – OEMP Reporting.

Corrective Action
Adaptive Management Strategy (AMS)
Comply with AMS, refer to Attachment I: Adaptive Management Strategy.
3.2.14 VISUAL AMENITY

Potential Impacts
Change to visual environment due to maintained cleared vegetation and surface infrastructure such as pumping stations and ancillary services.

Operational Objective
To operate and manage the raw water system to minimise impacts to visual amenity.

Performance Criteria
No complaints related to visual impacts.

Management Strategies
Operate in accordance with the following Sub-Plans:
- Pre-Operation Compliance Report – CoA C7
- Attachment G: Inspection and Maintenance Plan

Monitoring
Monitor in accordance with the following Sub-Plans:
- Attachment G: Inspection and Maintenance Plan

Visual amenity will be monitored by recording complaints. Refer to Section 3.2.17 – Complaints Management.

Reporting
Data and compliance reported in:
- Pre-Operation Compliance Report – A Pre-Operation Compliance Report detailing compliance with requirements of the Project Approval will be completed in accordance with CoA C7.
- Annual Review – refer to Section 4.4 – OEMP Reporting.

Corrective Action
Adaptive Management Strategy (AMS)
Comply with AMS, refer to Attachment I: Adaptive Management Strategy.
### 3.2.15 CONTAMINATION AND SOILS

<table>
<thead>
<tr>
<th>Potential Impacts</th>
<th>Erosion due to scour water and soil contamination.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operational Objective</td>
<td>To operate and manage the raw water system to minimise impacts on soil resources and prevent soil contamination.</td>
</tr>
<tr>
<td>Performance Criteria</td>
<td>• Compliance with OEMP</td>
</tr>
<tr>
<td>Management Strategies</td>
<td><strong>Operate in accordance with the following Sub-Plans:</strong></td>
</tr>
<tr>
<td></td>
<td>• Attachment F: Scour Water Management Plan</td>
</tr>
<tr>
<td></td>
<td>• Attachment G: Inspection and Maintenance Plan</td>
</tr>
<tr>
<td>Monitoring</td>
<td><strong>Monitor in accordance with the following Sub-Plans:</strong></td>
</tr>
<tr>
<td></td>
<td>• Attachment F: Scour Water Management Plan</td>
</tr>
<tr>
<td></td>
<td>• Attachment G: Inspection and Maintenance Plan</td>
</tr>
<tr>
<td>Reporting</td>
<td><strong>Data and compliance reported in:</strong></td>
</tr>
<tr>
<td></td>
<td>• Annual Review – refer to Section 4.4 – OEMP Reporting.</td>
</tr>
<tr>
<td>Corrective Action</td>
<td><strong>Adaptive Management Strategy (AMS)</strong></td>
</tr>
<tr>
<td></td>
<td>Comply with AMS, refer to Attachment I: Adaptive Management Strategy.</td>
</tr>
</tbody>
</table>
3.2.16 WASTE MANAGEMENT

Potential Impacts
Impacts to water quality from scour water and sediments generated by infrequent cleaning and dewatering requirements.

Operational Objective
To minimise waste generation and ensure wastes are properly managed.

Performance Criteria
Compliance with the OEMP.

Management Strategies
Operate in accordance with the following Sub-Plans:
- Attachment F: Scour Water Management Plan

Project Approval – Waste Management
- All waste materials generated during the operation of the raw water supply system shall be directed to an appropriately licensed waste management facility.
- No waste will be received.
- All waste materials generated during the operation of the raw water supply system shall be assessed and classified in accordance with the Waste Classification Guidelines (Department of Environment, Climate Change and Water, 2009).

Monitoring
Monitor in accordance with the following Sub-Plans:
- Attachment F: Scour Water Management Plan

Reporting
Data and compliance reported in:
- Annual Review – refer to Section 4.4 – OEMP Reporting.

Corrective Action
Adaptive Management Strategy (AMS)
Comply with AMS, refer to Attachment I: Adaptive Management Strategy.
### 3.2.17 COMPLAINTS MANAGEMENT

**Potential Impacts**

Issues relating to the operation of the raw water supply system are not identified.

**Operational Objective**

To provide a procedure for complaints management for the operation of the raw water supply system.

**Performance Criteria**

All complaints relating to the operation of the raw water supply system are recorded and managed through to closure.

**Management Strategies**

Operate in accordance with the following Sub-Plans:

- Attachment H: Stakeholder Engagement Plan including the Community Communication Strategy.

**Monitoring**

Operate in accordance with the following Sub-Plans:

- Attachment H: Stakeholder Engagement Plan including the Community Communication Strategy.

**Reporting**

Data and compliance reported in:

- Annual Review – refer to Section 4.4 – OEMP Reporting.

**Corrective Action**

Adaptive Management Strategy (AMS)

Comply with AMS, refer to Attachment I: Adaptive Management Strategy.
3.2.18 ENVIRONMENTAL INCIDENT MANAGEMENT

Potential Impacts
Impact to the environment and lack of continual improvement.

Operational Objective
Ensure all environmental incidents that have the potential to cause material harm to the environment are reported and have adequate follow-up.

Performance Criteria
Full documentation and follow through of environmental incidents.

Management Strategies
**OCC Incident Management:**
Environmental incidents shall be reported and managed using OCC’s procedures included in Council’s Water Quality Management System (WQMS). In particular, Council shall use the following existing forms and procedures:

- PLA220501 Water Quality Incident Management Plan
- SWI221801 Incident Investigation
- FRM221801 Incident Investigation
- SWI20512 Reporting Drinking Water Quality Incidents
- FRM221802 Incident Debrief Report

These procedures are included as uncontrolled documents in **Attachment N: OCC Incident Management Procedures.**

**Project Approval – Incident Reporting**
In the event of an incident that has caused, or threatens to cause, material harm to the environment, OCC shall notify the at the earliest opportunity:

- The Environmental Representative (only if within the first 12 months of operation); and
- The Director General.
Management Strategies (continued)  
Within 7 days of the date of the incident, OCC shall provide a written report to the above parties that provides:
- Details of the incident;
- Measures which have been or will be implemented to rectify the incident and a timeframe for implementation
- other details that may be requested.

OCC shall meet the requirements of the Director General in relation to any reported incidents.

Monitoring  
Nil

Reporting  
Data and compliance reported in:
- Annual Review – refer to Section 4.4 – OEMP Reporting.

Corrective Action  
Adaptive Management Strategy (AMS)
Comply with AMS, refer to Attachment I: Adaptive Management Strategy.
Monitoring and Review

4.1 ENVIRONMENTAL MONITORING

Specific environmental monitoring is outlined in the following sub-plans:

- **Attachment D: Aquatic Environment Monitoring Program** – water quality and aquatic environment monitoring
- **Attachment E: Hydrology Monitoring Program** – water quantity
- **Attachment J: Groundwater Monitoring Program** – groundwater quality and quantity

Drinking water quality monitoring will be undertaken in accordance with OCC’s Drinking Water Management System.

Annual reporting will be completed in accordance with each sub-plan. Evaluation of the monitoring results will be undertaken against the objectives outlined in each sub-plan.

A consolidated Annual Review will be completed in accordance with **Section 4.4 – OEMP Reporting**. Results of the Annual Review and any audit reports that may have been completed in the operating year will inform the adaptive management process.

4.2 ADAPTIVE MANAGEMENT STRATEGY

An Adaptive Management Strategy has been developed to set out the procedures to manage the operation of the OCC raw water supply system in response to Aquatic Environment Monitoring Program (AEMP) monitoring results and the operating rules defined by the Decision Support Tool (DST). The AMS is included as **Attachment I: Adaptive Management Strategy**.

In accordance with CoA D3, the AMS applies to:

- The Aquatic Environment Monitoring Program (CoA B1);
- The Decision Support Tool (CoA B3);
- The operating rules defined in CoA B4; and
- Annual Review (CoA C5).

The AMS is a formal process that facilitates evaluation and review of management practices in light of the knowledge gained through monitoring. The updating and review process may simply increase the confidence in the suitability of existing management plans. However, this process may also uncover new insights about how management actions are affecting the achievement of management objectives.
4.3 ENVIRONMENTAL AUDITING AND COMPLIANCE

4.3.1 FUNCTION

Auditing of the OEMP will be undertaken to ensure its implementation and effectiveness. These compliance audits will determine whether or not the OEMP is being properly implemented and maintained.

4.3.2 INTERNAL AUDIT

In the first twelve (12) months of operation two (2) internal compliance audits will be completed. These audits will be undertaken by Orange City Council’s Water Compliance Coordinator.

The audits will be documented and a record maintained.

The frequency of internal audits will reduce to one (1) per year after the first year of operation.

4.3.3 INDEPENDENT ENVIRONMENTAL AUDIT

Within the first two (2) years of the date of the Project Approval MP10_0235 (18 June 2013), and every three (3) years thereafter, unless the Director-General directs otherwise, Orange City Council will commission an Independent Environmental Audit of the Project against the requirements of the Project Approval.

In accordance with CoA C10, this audit must:

(a) Be conducted by a suitable qualified, experience and independent team of experts whose appointment has been endorsed by the Director-General;

(b) Include consultation with the relevant agencies;

(c) Assess the environmental performance of the Project to assess whether it is complying with the requirements in this approval (including any assessment, strategy, plan or program required under this approval);

(d) Review the adequacy of any approved strategy, plan or program required under the abovementioned approval against monitoring results obtained under this approval; and

(e) Recommend measures or actions to improve the environmental performance of the development, and/or any strategy, plan or program required under these approvals or licences.

The independent audit team must be led by a suitably qualified auditor, and include experts in hydrology, ecology, restoration/rehabilitation of agricultural land and native vegetation and any other fields specified by the Director-General.

Within three (3) months of commissioning the Independent Environmental Audit, or as otherwise agreed by the Director General, Orange City Council shall submit a copy of the audit
to the Director General along with its response to any recommendations contained in the audit report.

Orange City Council have received confirmation from the Department of Planning and Environment (DP&E) that the independent environmental audit can be deferred. Orange City Council are currently waiting on advice from DP&E on timing of the audit.

4.4 OEMP REPORTING

4.4.1 OPERATING YEAR

The operating year is defined as 1 July to 30 June. This is to be consistent with the water year as used by the DPI Water for reporting under the Water Management Act 2000.

4.4.2 SUB-PLAN REPORTING

The following sub-plan reports shall be prepared by 1 September each year:

- AEMP Annual Report (refer to Attachment D: Aquatic Environment Monitoring Program);
- Annual Hydrology Report (refer to Attachment E: Hydrology Monitoring Program); and

The scope of these reports is described in the relevant sub-plan.

These sub-plan reports shall be appended to, and summarised in, the Annual Review report.

4.4.3 ANNUAL REVIEW

4.4.3.1 Timing

The Annual Review will be submitted by 1 September (or nearest working day) each year and shall report on the previous water year.

4.4.3.2 Scope

The Annual Review will be a summary of the environmental performance of the Orange raw water supply system for the previous water year. The summary will:

(a) Describe the activities that were carried out in the previous year, and the activities that are proposed to be carried out over the next year including:

   (i) Monitoring of the extraction process, quantity of water extracted, flow in the river/creek sources during extraction, duration of extraction and flows in Summer Hill Creek;

   (ii) Raw water quality in the Macquarie River and Suma Park Dam during extraction; and
(iii) Quantities and quality of scour water released during maintenance or emergency activities on the MOP.

(b) Include a summary of the monitoring results and complaints records including a comparison of these results against the:

(i) conditions, approvals/licenses, limits and performance objectives;
(ii) requirements of this OEMP;
(iii) monitoring results of previous years including:
   a. water extraction – the annual water balance from the Annual Hydrology Report
   b. water quality – Suma Park Dam, Summer Hill Creek, Macquarie River and groundwater
   c. aquatic ecology
   d. any specific studies undertaken in the reporting year
(iv) relevant predictions made in assessment documentation.

(c) Identify any non-conformance over the previous year and describe what actions were (or are being) taken to ensure compliance;

(d) Identify any trends in the monitoring data over the life of the system from the commencement of this OEMP;

(e) Identify any discrepancies between the predicted and actual impacts of the development, and analyse the potential cause of any significant discrepancies; and

(f) Identify measures that could be implemented to improve the environmental performance of the raw water system and justification for any decisions to not implement those measures.

The AEMP Annual Report (refer to Attachment D: Aquatic Environment Monitoring Program), Annual Hydrology Report (refer to Attachment E: Hydrology Monitoring Program) and Annual Groundwater Monitoring Report (refer to Attachment J: Groundwater Monitoring Program) shall be appended to the Annual Review with a brief summary of each provided in the Annual Review.

4.4.3.3 Annual Review Meeting

The Water and Sewerage Strategic Manager shall convene an Annual Review meeting to be held in the last week of August each year. This meeting will include:

- Director Technical Services;
- Water Treatment Manager;
- Water Treatment Supervisor;
- Water and Sewer Engineer;
• Other relevant OCC staff; and
• Specialist advisors (as required).

The meeting will discuss and finalise the Annual Review.

4.4.3.4 Annual Review Dissemination

The Annual Review will be disseminated to the following agencies:

• DPI (Water and Fisheries);
• Office of Environment and Heritage (OEH);
• Department of the Environment and Energy (formerly DSEWPC); and
• Department of Planning and Environment.

A copy of the Annual Review shall be made available on the Orange City Council website.

4.5 ACCESS TO INFORMATION

Access to information is detailed in the Stakeholder Engagement Plan (Attachment H: Stakeholder Engagement Plan).

The Orange City Council website will provide links to data and reports relating to the operation of the Orange raw water supply system. The web site will contain at least the following documents:

• All relevant project documents, approvals and licences;
• Links to the DPI Water real time data websites for stream gauging sites that have real time data reporting;
• The current version of this OEMP;
• The current operating rules;
• The Monthly Extraction Report(s);
• The latest Annual Review completed in accordance with Section 4.4 – OEMP Reporting;
• Any independent environmental audit completed in accordance with Section 4.3 – Environmental Auditing and Compliance; and
• Any other matter required by the Director-General.

The website will include at least three (3) years of the reports that are completed on an annual basis and at least 12 months of the Monthly Extraction Report.
4.6 OEMP REVIEW

4.6.1 REVISION TO STRATEGIES, PLANS AND PROGRAMS

Orange City Council shall review, and if necessary revise, strategies, plans and programs included in the OEMP to the satisfaction of the Director-General within three (3) months of:

a) the Annual Review (Section 4.4 – OEMP Reporting);

b) any Incident Report (Section 3.2.18 – Environmental Incident Management);

c) an Audit Report (Section 4.3 – Environmental Auditing and Compliance); or

d) any modification to the conditions of the Project Approval,

This is to ensure that plans and programs are updated on a regular basis, and incorporate any recommended measures to improve environmental performance.

4.6.2 DOCUMENT CONTROL

The following will be classed as ‘major’ revisions:

- Changes to processes;
- Changes to monitoring programs, either timing or parameters monitored;
- Changes made in response to an incident; and/or
- Changes requested by a relevant Government agency.

Major revisions will be identified by the whole number in the version number (i.e. 1.0, 2.0, 3.0....) and will be reviewed, approved and re-circulated as necessary.

The following will be classed as ‘minor’ revisions:

- Minor typing and grammar corrections;
- Changes to position titles; and
- Updates to recording forms to suit changes in operations.

Minor revisions will be identified by the decimal point in the version number (i.e. 1.1, 2.2, 3.3....) and will not require review and approval prior to re-circulation.

Major and minor revisions will be listed in the Revision History for each section of this OEMP with a full record being kept in the Document Control section at the front of this OEMP.
Attachment A

RISK MANAGEMENT
## Revision History

<table>
<thead>
<tr>
<th>Version</th>
<th>Revision Date</th>
<th>Details</th>
<th>Authorised</th>
</tr>
</thead>
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<tr>
<td>1.0</td>
<td>08/04/16</td>
<td>Draft for review</td>
<td>M Haege/Geolyse</td>
</tr>
<tr>
<td>2.0</td>
<td>09/05/16</td>
<td>Issue for implementation</td>
<td>M Haege/Geolyse</td>
</tr>
<tr>
<td>2.1</td>
<td>22/09/16</td>
<td>Minor edits</td>
<td>M Haege/Geolyse</td>
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## ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>AEMP</td>
<td>Aquatic Environmental Monitoring Program</td>
</tr>
<tr>
<td>AHD</td>
<td>Australian height datum</td>
</tr>
<tr>
<td>AMS</td>
<td>Adaptive management strategy</td>
</tr>
<tr>
<td>ANZECC</td>
<td>Australian and New Zealand Environment and Conservation Council</td>
</tr>
<tr>
<td>ARMCANZ</td>
<td>Agriculture and Resource Management Council of Australia and New Zealand</td>
</tr>
<tr>
<td>BSCSHS</td>
<td>Blackmans Swamp Creek stormwater harvesting scheme</td>
</tr>
<tr>
<td>CCS</td>
<td>Community communication strategy</td>
</tr>
<tr>
<td>CTF</td>
<td>Cease to flow</td>
</tr>
<tr>
<td>CoA</td>
<td>Condition of approval</td>
</tr>
<tr>
<td>DEE</td>
<td>Department of Environment and Energy</td>
</tr>
<tr>
<td>DST</td>
<td>Decision Support Tool</td>
</tr>
<tr>
<td>DPI</td>
<td>Department of Primary Industries</td>
</tr>
<tr>
<td>DPI Water</td>
<td>Department of Primary Industries Water</td>
</tr>
<tr>
<td>DSEWPC</td>
<td>Department of Sustainability, Environment, Water, Population and Communities (now DEE)</td>
</tr>
<tr>
<td>EA</td>
<td>Environmental Assessment</td>
</tr>
<tr>
<td>EP&amp;A Act</td>
<td>NSW Environmental Planning and Assessment Act 1979</td>
</tr>
<tr>
<td>GL</td>
<td>Gigalitre (1,000 megalitres)</td>
</tr>
<tr>
<td>GMP</td>
<td>Groundwater monitoring program</td>
</tr>
<tr>
<td>ha</td>
<td>Hectares</td>
</tr>
<tr>
<td>HMP</td>
<td>Hydrology monitoring program</td>
</tr>
<tr>
<td>IMP</td>
<td>Inspection and maintenance plan</td>
</tr>
<tr>
<td>kL</td>
<td>Kilolitre (1,000 litres)</td>
</tr>
<tr>
<td>km</td>
<td>Kilometre (1,000 metres)</td>
</tr>
<tr>
<td>kWhr</td>
<td>Kilowatt hour</td>
</tr>
<tr>
<td>L</td>
<td>Litre (1,000 millilitres)</td>
</tr>
<tr>
<td>LGA</td>
<td>Local Government Area</td>
</tr>
<tr>
<td>L/s</td>
<td>Litres per second</td>
</tr>
<tr>
<td>m³</td>
<td>Cubic metre (1,000 litres)</td>
</tr>
<tr>
<td>m³/hr</td>
<td>Cubic metres per hour</td>
</tr>
<tr>
<td>m³/s</td>
<td>Cubic metres per second</td>
</tr>
<tr>
<td>mg/L</td>
<td>Milligrams per litre</td>
</tr>
<tr>
<td>mL</td>
<td>Millilitre</td>
</tr>
<tr>
<td>ML</td>
<td>Megalitre (1 million litres or 1,000 kilolitres)</td>
</tr>
<tr>
<td>ML/day</td>
<td>Megalitres per day</td>
</tr>
<tr>
<td>m</td>
<td>Metre</td>
</tr>
<tr>
<td>mm</td>
<td>Millimetre</td>
</tr>
<tr>
<td>MOP</td>
<td>Macquarie River to Orange pipeline</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Description</td>
</tr>
<tr>
<td>--------------</td>
<td>-------------</td>
</tr>
<tr>
<td>OCC</td>
<td>Orange City Council</td>
</tr>
<tr>
<td>OEMP</td>
<td>Operation Environmental Management Plan</td>
</tr>
<tr>
<td>PA</td>
<td>Project approval</td>
</tr>
<tr>
<td>PCSHS</td>
<td>Ploughmans Creek stormwater harvesting scheme</td>
</tr>
<tr>
<td>ScWMP</td>
<td>Scour water management plan</td>
</tr>
<tr>
<td>SEP</td>
<td>Stakeholder engagement plan</td>
</tr>
<tr>
<td>STP</td>
<td>Sewage treatment plant</td>
</tr>
<tr>
<td>µg/L</td>
<td>Micrograms per litre</td>
</tr>
<tr>
<td>µS/cm</td>
<td>Micro Siemens per centimetre</td>
</tr>
<tr>
<td>WAL</td>
<td>Water access licence</td>
</tr>
<tr>
<td>WFP</td>
<td>Water filtration plant</td>
</tr>
<tr>
<td>WSP</td>
<td>Water sharing plan</td>
</tr>
</tbody>
</table>
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1.1 INTRODUCTION

This Risk Management Plan (RMP) forms part of the Orange Raw Water Supply Operational Environmental Monitoring Plan (OEMP). It describes how Orange City Council has assessed risk and the relevant controls proposed.

1.2 RISK MANAGEMENT FRAMEWORK

The risk rating is a factor of the consequence of an impact occurring and the likelihood of the impact occurring. Depending on the combination of consequence and likelihood, the overall risk rating could be low to very high. Very high risks (termed ‘key risks’) have warranted a higher level of control.

1.2.1 CONSEQUENCE

A consequence is the outcome (impact) of an event as described in Table 1.1.

Table 1.1 – Consequence levels

<table>
<thead>
<tr>
<th>Level</th>
<th>Likelihood</th>
<th>Example description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Negligible</td>
<td>Negligible impact, little disruption to normal operation, low increase in normal operation costs.</td>
</tr>
<tr>
<td>2</td>
<td>Minor</td>
<td>Minor impact for small population, some manageable operation disruption, some increase in operating costs.</td>
</tr>
<tr>
<td>3</td>
<td>Moderate</td>
<td>Minor impact for large population, significant modification to normal operation but manageable, operation costs increased, increased monitoring.</td>
</tr>
<tr>
<td>4</td>
<td>Major</td>
<td>Major impact for small population, systems significantly compromised and abnormal operation if at all, high level of monitoring required.</td>
</tr>
<tr>
<td>5</td>
<td>Severe</td>
<td>Severe impact for large population, complete failure of systems.</td>
</tr>
</tbody>
</table>

1.2.2 LIKELIHOOD

Likelihood is the chance that something might happen. The information provided in the Table 1.2 is used to determine the likelihood of identified risks.
Table 1.2 – Likelihood description and frequencies

<table>
<thead>
<tr>
<th>Level</th>
<th>Likelihood</th>
<th>Example description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Almost certain</td>
<td>Will happen: imminent or will occur in 1 to 6 months</td>
</tr>
<tr>
<td>B</td>
<td>Likely</td>
<td>Expected to happen: expected to occur at least once in a 6 to 12 month period</td>
</tr>
<tr>
<td>C</td>
<td>Possible</td>
<td>Could happen: will probably occur between 1 to 5 years</td>
</tr>
<tr>
<td>D</td>
<td>Unlikely</td>
<td>Not expected to happen: may occur once every 5 to 10 years</td>
</tr>
<tr>
<td>E</td>
<td>Rare</td>
<td>Uncommon, unusual: not likely to occur within a 10 year period</td>
</tr>
</tbody>
</table>

1.3 RISK MATRIX

The rating of risks is evaluated using the matrix in Table 1.3. The scoring of risk is a subjective process. When assessing the likelihood and consequence of a particular risk, the following information is considered:

- The environmental impact assessment and suggested mitigation measures;
- Results of site audits or observations;
- Past history and similar occurrences and situations; and
- Review of relevant documentation and data.

The risk level actions are:

1. immediate action
2. action within one week
3. action within one month
4. Monitor
5. Monitor

Table 1.3 – Risk rating table

<table>
<thead>
<tr>
<th>LIKELIHOOD</th>
<th>CONSEQUENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Negligible</td>
</tr>
<tr>
<td>Almost certain</td>
<td>5</td>
</tr>
<tr>
<td>Likely</td>
<td>5</td>
</tr>
<tr>
<td>Possible</td>
<td>5</td>
</tr>
<tr>
<td>Unlikely</td>
<td>5</td>
</tr>
<tr>
<td>Rare</td>
<td>5</td>
</tr>
</tbody>
</table>
1.4 RISK REGISTER

A register of operation environmental hazards, the anticipated level of risk and relevant control measure is provided in Appendix A.

This register shall be updated as required during operation if new environmental hazards are identified or environmental controls altered.

1.5 RMP REVIEW

1.5.1 REVISION TO STRATEGIES, PLANS AND PROGRAMS

CoA C6 requires that OCC shall review strategies, plans and programs included in the OEMP to the satisfaction of the Director-General within 3 months of:

a) the Annual Review (Section 4.4 – OEMP Reporting);

b) any Incident Report (Section 3.2.18 – Environmental Incident Management);

c) an Audit Report (Section 4.3 – Environmental Auditing and Compliance); or

d) any modification to the conditions of the Project Approval,

This is to ensure that plans and programs are updated on a regular basis, and incorporate any recommended measures to improve environmental performance.

1.5.2 DOCUMENT CONTROL

The following will be classed as ‘major’ revisions:

- Changes to processes;
- Changes to monitoring programs, either timing or parameters monitored;
- Changes made in response to an incident; and/or
- Changes requested by a relevant Government agency.

Major revisions will be identified by the whole number in the version number (i.e. 1.0, 2.0, 3.0...) and will be reviewed, approved and re-circulated as necessary.

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- Minor typing and grammar corrections;
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- Updates to recording forms to suit changes in operations.

Minor revisions will be identified by the decimal point in the version number (i.e. 1.1, 2.2, 3.3...) and will not require review and approval prior to re-circulation.

Major and minor revisions will be listed in the Revision History at the front of this document.
Appendix A – Risk Register
## OCC Raw Water System: RISK REGISTER

### Version 2.1: 22 September 2016

<table>
<thead>
<tr>
<th>Number</th>
<th>Risk Management Area</th>
<th>Cause</th>
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<th>Controls</th>
<th>Current Risk Rating</th>
<th>Responsible Person</th>
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<tr>
<td><strong>1</strong></td>
<td>Extraction Volume</td>
<td>Ineffective management and monitoring of extraction volumes.</td>
<td>Exceed water share listed on the various Water Access Licences.</td>
<td>OEMP Section 3.2.1 Extraction Volume Hydrology Monitoring Program</td>
<td>1 Negligible C Possible 1C 5</td>
<td>Water and Sewerage Strategic Manager</td>
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<tr>
<td><strong>2</strong></td>
<td>Operating Rules</td>
<td>Not complying with approved operating conditions.</td>
<td>Departure from approved operating conditions causing changes to creek and river flow regimes that are different to the predictions made in the various assessment documents.</td>
<td>OEMP Section 3.2.2 Operating Rules Decision Support Tool</td>
<td>3 Moderate D Unlikely 3D 4</td>
<td>Water and Sewerage Strategic Manager</td>
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<tr>
<td><strong>3</strong></td>
<td>Gauging Stations</td>
<td>Inadequate maintenance/monitoring of gauging stations.</td>
<td>Gauging stations do not accurately reflect flow and incorrectly trigger harvest operations.</td>
<td>OEMP Section 3.2.3 Gauging Stations Hydrology Monitoring Program</td>
<td>2 Minor D Unlikely 2D 5</td>
<td>Water Treatment Manager</td>
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<tr>
<td><strong>4</strong></td>
<td>Environmental Water Quality</td>
<td>Ineffective management and monitoring of water quality.</td>
<td>Deterioration of surface and groundwater quality. Impact on aquatic habitat.</td>
<td>OEMP Section 3.2.4 Water Quality Aquatic Environment Monitoring Program</td>
<td>3 Moderate D Unlikely 3D 4</td>
<td>Water Treatment Manager</td>
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<tr>
<td><strong>5</strong></td>
<td>Drinking water</td>
<td>Drinking water quality targets for external sources not met. Lack of monitoring and control.</td>
<td>Impact on raw water quality in Suma Park Dam that compromises drinking water quality.</td>
<td>OEMP Section 3.2.4 Water Quality OCC Drinking Water Management System</td>
<td>3 Moderate E Rare 3E 4</td>
<td>Water Treatment Manager</td>
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<td><strong>6</strong></td>
<td>Aquatic Ecology</td>
<td>Ineffective management and monitoring of water quality and hydrology.</td>
<td>Alteration to feeding and spawning habitats, entrapment during offtake operation, and indirect impacts to habitat as a result of changes to water quality and flow.</td>
<td>OEMP Section 3.2.5 Aquatic Ecology Aquatic Environment Monitoring Program</td>
<td>3 Moderate E Rare 3E 4</td>
<td>Water Treatment Manager</td>
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<td><strong>7</strong></td>
<td>Environmental Flow Rules</td>
<td>Lack of monitoring. System failure.</td>
<td>Do not comply with approval conditions.</td>
<td>OEMP Section 3.2.6 Environmental Flow Rules Hydrology Monitoring Program</td>
<td>2 Minor D Unlikely 2D 5</td>
<td>Water Treatment Manager</td>
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<td><strong>8</strong></td>
<td>Groundwater Management</td>
<td>Ineffective management and monitoring of groundwater levels and quality.</td>
<td>Deterioration of groundwater quality. Impact on other groundwater users through reduction in water levels.</td>
<td>OEMP Section 3.2.7 Groundwater Management Groundwater Monitoring Program</td>
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<td>Water Treatment Manager</td>
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<td><strong>9</strong></td>
<td>Terrestrial Ecology</td>
<td>Scour water discharge.</td>
<td>Downslope or downstream habitat sedimentation, and modification of vegetation composition in the long term (if releases occur periodically).</td>
<td>OEMP Section 3.2.8 Terrestrial Ecology Scour Water Management Plan Inspection and Maintenance Plan</td>
<td>2 Minor D Unlikely 2D 5</td>
<td>Water Treatment Manager</td>
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<td><strong>10</strong></td>
<td>Stakeholder Engagement</td>
<td>Ineffective communication with stakeholders.</td>
<td>Misinformation in the community. Disgruntled community.</td>
<td>OEMP Section 3.2.9 Stakeholder Management Stakeholder Engagement Plan</td>
<td>2 Minor D Unlikely 2D 5</td>
<td>Water and Sewerage Strategic Manager</td>
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<tr>
<td><strong>11</strong></td>
<td>Air Quality</td>
<td>Dust generation from maintenance crews traversing unsealed roads and the easement.</td>
<td>Infrequent impacts to air quality due to dust generation.</td>
<td>OEMP Section 3.2.10 Air Quality Inspection and Maintenance Plan</td>
<td>1 Negligible C Possible 1C 5</td>
<td>Water and Sewerage Strategic Manager</td>
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<tr>
<td><strong>12</strong></td>
<td>Noise and Vibration</td>
<td>Operational traffic, and inadequate maintenance/monitoring of noise-generating infrastructure.</td>
<td>Impact on local noise amenity.</td>
<td>OEMP Section 3.2.11 Noise and Vibration</td>
<td>2 Minor D Unlikely 2D 5</td>
<td>Water and Sewerage Strategic Manager</td>
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<td>Number</td>
<td>Risk Management Area</td>
<td>Cause</td>
<td>Effect/Impact</td>
<td>Controls</td>
<td>Current Risk Rating</td>
<td>Responsible Person</td>
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<tr>
<td>13</td>
<td>Land Use</td>
<td>Impact on landuse during operation and maintenance.</td>
<td>Decreased development potential of land within the easement due to restrictions included in the acquisition agreement between Landowners and Council.</td>
<td>OEMP Section 3.2.12 Land Use Inspection and Maintenance Plan Stakeholder Engagement Plan</td>
<td>2 Minor D Unlikely 2D 5</td>
<td>Water and Sewerage Strategic Manager</td>
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<td>14</td>
<td>Traffic Management</td>
<td>Operational traffic.</td>
<td>Minor traffic and road impacts.</td>
<td>OEMEP Section 3.2.13 Traffic Management Inspection and Maintenance Plan</td>
<td>1 Negligible C Possible 1C 5</td>
<td>Water and Sewer Strategic Manager</td>
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<td>16</td>
<td>Visual Amenity</td>
<td>Maintained cleared vegetation and surface infrastructure such as pumping stations and ancillary services</td>
<td>Change to local visual environment.</td>
<td>OEMEP Section 3.2.14 Visual Amenity</td>
<td>2 Minor D Unlikely 2D 5</td>
<td>Water and Sewer Strategic Manager</td>
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<td>17</td>
<td>Contamination and Soils</td>
<td>Scour water and contamination</td>
<td>Erosion and soil contamination</td>
<td>OEMEP Section 3.2.15 Contamination and Soils Scour Water Management Plan</td>
<td>2 Minor D Unlikely 2D 5</td>
<td>Water Treatment Manager</td>
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<td>18</td>
<td>Waste Management</td>
<td>Scour water and sediments generated by infrequent cleaning and dewatering requirements.</td>
<td>Impacts to water quality.</td>
<td>OEMEP Section 3.2.16 Waste Management Scour Water Management Plan</td>
<td>1 Negligible D Unlikely 1D 5</td>
<td>Water Treatment Manager</td>
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<tr>
<td>19</td>
<td>Complaints Management</td>
<td>Not following procedures.</td>
<td>Disgruntled community. Lack of feedback and follow up.</td>
<td>OEMEP Section 3.2.17 Complaints Management Stakeholder Engagement Plan</td>
<td>2 Minor D Unlikely 2D 5</td>
<td>Water and Sewerage Strategic Manager</td>
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<td>20</td>
<td>Environmental Incident Management</td>
<td>Not following procedures.</td>
<td>No continual improvement. OEMEP not updated.</td>
<td>OEMEP Section 3.2.18 Environmental Incident Management Adaptive Management Strategy</td>
<td>3 Moderate D Unlikely 3D 4</td>
<td>Water and Sewerage Strategic Manager</td>
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<tr>
<td>21</td>
<td>Non compliance with OEMP</td>
<td>Lack of personnel training. Lack of monitoring. Lack of adulting.</td>
<td>Non compliance with OEMP and possible environmental impact.</td>
<td>OEMEP Section 3.2.19 Environmental Incident Management OEMEP Section 4.3 Environmental auditing and compliance Adaptive Management Strategy OEMEP Section 2.5 Environmental Training</td>
<td>3 Moderate E Rare 3E 4</td>
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Risk Level Actions:

1. Immediate action
2. Action within 1 week
3. Action within 1 month
4. Monitor
5. Monitor
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<td>Cobbs Hut Hole pool at the river gauge, and 2 downstream riffle sites - once only when conditions are suitable</td>
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<td>Site 15, Site 45, Site 46, Site 47 and Site 42 - monthly for 3 years</td>
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<td>Summer Hill Creek monitoring sites - 2 times per year in Autumn (mar-june) and spring (sept-dec)</td>
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**NOTES/OEMP REFERENCE**

- DST - water year analysis
  - Completed in July for next water year. DST (Attachment C)
  - WSSM

- DST - quarterly review
  - WSSM

- Monthly extraction report
  - WSSM

- Annual Review - completed by 1 September each year
  - WSSM

**Responsibility**

- WSSM = Water and Sewerage Strategic Manager
- WTM = Water Treatment Manager
- WCC = Water Compliance Coordinator
- WSE = Water and Sewer Engineer

* An extension was approved by DP&E on 17/10/2017. OCC are to notify DP&E on 6 monthly basis

**Sites**

- Site 15 - Suma Park Dam Offtake
- Site 42 - Macquarie River Pump Station 1 Offtake at Cobbs Hut Hole
- Site 45 - Bulgas Road Suma Park Dam
- Site 46 - Third Crossing Suma Park Dam
- Site 47 - Ophir Reserve Suma Park Dam

**Version 3.0**

**Issued:** 15 June 2018
DECISION SUPPORT TOOL

RAW WATER SUPPLY OEMP – ATTACHMENT C

THE FIVE C’S

JUNE 2018
# Revision History

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<td>06/10/15</td>
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<td>15 June 18</td>
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ABBREVIATIONS

AEMP  Aquatic Environmental Monitoring Program
AHD  Australian height datum
AMS  Adaptive management strategy
ANZECC  Australian and New Zealand Environment and Conservation Council
ARMCANZ  Agriculture and Resource Management Council of Australia and New Zealand
BSCSHS  Blackmans Swamp Creek stormwater harvesting scheme
CCS  Community communication strategy
CTF  Cease to flow
CoA  Condition of approval
DEE  Department of Environment and Energy
DST  Decision Support Tool
DP&E  Department of Planning and Environment
DoI  Department of Industry
DPI  Department of Primary Industries
DPI Water  Department of Primary Industries Water
DSEWPC  Department of Sustainability, Environment, Water, Population and Communities (now DEE)
EA  Environmental Assessment
EP&A Act  NSW Environmental Planning and Assessment Act 1979
GL  Gigalitre (1,000 megalitres)
GMP  Groundwater monitoring program
ha  Hectares
HMP  Hydrology monitoring program
IMP  Inspection and maintenance plan
kL  Kilolitre (1,000 litres)
km  Kilometre (1,000 metres)
kWhr  Kilowatt hour
L  Litre (1,000 millilitres)
LGA  Local Government Area
L/s  Litres per second
m³  Cubic metre (1,000 litres)
m³/hr  Cubic metres per hour
m³/s  Cubic metres per second
mg/L  Milligrams per litre
mL  Millilitre
ML  Megalitre (1 million litres or 1,000 kilolitres)
ML/day  Megalitres per day
m  Metre
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<tr>
<td>mm</td>
<td>Millimetre</td>
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<tr>
<td>MOP</td>
<td>Macquarie River to Orange pipeline</td>
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<td>OCC</td>
<td>Orange City Council</td>
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<td>OEMP</td>
<td>Operation Environmental Management Plan</td>
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<td>Scour water management plan</td>
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<td>SEP</td>
<td>Stakeholder engagement plan</td>
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<td>STP</td>
<td>Sewage treatment plant</td>
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<td>µg/L</td>
<td>Micrograms per litre</td>
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<td>µS/cm</td>
<td>Micro Siemens per centimetre</td>
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<td>WAL</td>
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<td>Water sharing plan</td>
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1.1 Introduction

This Decision Support Tool (DST) forms part of the Orange Raw Water Supply Operation Environmental Monitoring Plan (OEMP).

It is the key tool for determining how the raw water supply system will be operated on a year to year basis.

1.2 DST Context

An outline of the proposed DST was provided during the assessment of the Macquarie River to Orange Pipeline. The DST has been further developed following approval of the pipeline project and consideration of other raw water supply sources.

Specific requirements are provided below.

Project Approval for the Macquarie River to Orange pipeline

Relevant conditions of the Project Approval that outline the requirements for the DST are as follows:

B3 The Orange Water Supply System Decision Support Tool included in the document reference in Condition A2(c) [Macquarie River to Orange Pipeline Preferred Project Report] shall be finalised in consultation with the DPI (NOW) and the Dams Safety Committee and implemented prior to the commencement of operation of the Project, the Decision Support Tool shall also include:

(a) Likely operating scenarios including raw water triggers under a range of climatic conditions, growth scenarios and assumptions for the operation of the project;

(b) Proposed interaction and optimisation of the water supply components of the Orange Water Supply System; and

(c) The operating rules as modified by conditions B4, B5 and B6.

B4 The Project is to be operated consistent with:

(a) The Orange Water Supply Decision Support Tool in condition B3;

(b) The operating rules where:

i. Pumping is only to occur when the instantaneous river flow immediately downstream of the pumps will exceed the 80th percentile flow (the note below specifies how the 80th percentile flow rate is determined); and
ii. No more than 12 ML is to be extracted from the Macquarie river at Cobbs Hut Hole over any 24 hour period; and  

iii. The instantaneous rate of extraction is not to exceed 15.2 ML/day; and  

iv. The water level in Suma Park Dam is less than 90 percent full; and  

v. A cease to pump trigger applies, corresponding to a flow in the Macquarie river at Gauging Station 421192 (upstream of the pumps) of 15.2 ML/day above the 80th percentile flow (e.g. 92 +15.2 =~108 ML/day); and

(c) The river flow margin of error for Gauging Station 421192 determined in accordance with condition B6.

B6 River flow gaugings shall be completed for Gauging Station 421192 in order to improve and verify the streamflow rating for the Macquarie River at Gauging Station 421192, in consultation with DPI (NOW).

The operating rules shall adopt a flow trigger that includes a margin of error of the flow rating determined in consultation with DPI (NOW) until such time as DPI (NOW) is satisfied that the flow rating correlates with flows in the Macquarie River at Gauging Station 421192.

Project Approval condition B5 relates to the possible changes to the Macquarie River to Orange Pipeline operating rules based on consideration of further river flow data, modelling and stream gauging. This would only be undertaken if Councils deems it is necessary. Its scope is included in the Management Studies section of the OEMP.

**System Wide Tool**

While the need for a documented DST was triggered by the Macquarie River to Orange Pipeline project approval, by necessity it needs to be a system wide tool that considers all raw water supplies (refer to Project Approval condition B3(b)).

### 1.3 DST OBJECTIVES

The overall objective of the DST is to manage and optimise the use of the various raw water supplies in the system based on the “Five C’s”:

- **Critical level** – operating the system to ensure that:  
  - the combined storage is at or above a defined critical level at the end of each water year; and/or  
  - restriction regimes are consistent with the frequency and duration of restriction components of the 5/10/10 secure yield rule.

- **Climate** – adopting operating rules based on expected climatic conditions.
• **Controlling spill** – minimising spill from Suma Park Dam by operating the system cognisant of forecast climatic conditions and likely catchment inflow.

• **Conditions** – ensuring all raw water supplies are operated in accordance with approval conditions.

• **Cost** – minimising the cost of the raw water supply by adopting operating rules that use the lowest cost water first.

Background to, and details of, these objectives are provided in Section 2.5.
Water Supply System

2.1 APPROVED WATER SUPPLIES

The existing Orange water supply system consists of the following elements (Figure 1):

- Surface water catchments and the main reservoirs formed by Gosling Creek, Spring Creek and Suma Park Dams;
- The Blackmans Swamp Creek stormwater harvesting scheme – currently approved to operate whenever the level in Suma Park reservoir is below 100% (BSCSHS Stage 1b);
- The Ploughmans Creek stormwater harvesting scheme – currently approved to operate whenever the level in the stormwater harvesting holding pond is below 100%;
- The Macquarie River to Orange Pipeline – currently approved to transfer 12 ML/day whenever the level in Suma Park reservoir is below 90% and the flow in the Macquarie River at the offtake point is greater than 108 ML/day (the 12/108/90 operating rule); and
- Groundwater bores at the Showground, Margaret Street Depot and Clifton Grove.

Figure 1: Orange water supply system
2.2 FORECAST DEMAND

Forecast demand modelling was undertaken for the IWCM Evaluation Study and is shown in Figure 2 through to 2060 for medium and high population growth. The 2010 unrestricted water demand is modelled at 5,400 ML/year and demand management measures are predicted to keep the average annual water demand at around this level for five years or so. Then population growth will then start to increase the demand.

Figure 2: Orange city forecast water demand

2.3 SYSTEM SECURE YIELD

The secure yield of the existing system is 7,900 ML/year (based on the 5/10/10 rule) made up of:

- Surface water catchments (Gosling, Spring Creek and Suma Park Dam) = 3,400 ML/year
- Harvesting schemes (Blackmans Swamp Creek and Ploughmans Creek) = 1,100 ML/year
- Bores (Licensed for 462 ML/year) = 450 ML/year
- Macquarie River (12/108/90 rule) = 2,800 ML/year
- Raising Suma Park Dam = 150 ML/year
The water security provided by the existing system is demonstrated in **Figure 3**. This shows that the existing water supply infrastructure components provide water security for around 50 years.

**Figure 3:** Water security with existing water supply infrastructure – no climate change

### 2.4 SECURE YIELD, ACTUAL SUPPLY AND RISK MANAGEMENT

Secure yield is a strategic water supply assessment that demonstrates the water supply system can be operated to provide water security for Orange subject to the restriction regime defined by the 5/10/10 rule (refer to **Section 2.5**). This water security is provided through drought periods. The secure yield does not represent a volume that will or can be supplied each year.

The volume of water supplied by any of the sources will vary from year to year depending on demand (which is influenced by climate, demand management measures and population), climate and how each particular water source is performing. Operation of the water supply system will therefore be dynamic and will vary from year to year depending on these factors.

Furthermore, predicting climate sequences into the future is uncertain, so operation of the system takes on a risk management approach. That is, as the system enters a drought period, it is not possible to predict with certainty how bad that drought sequence will be. Keeping the system storage fuller using external sources (bores, stormwater harvesting and the Macquarie River) reduces the risk of running out of water through an extended drought. The trade off...
with this risk management approach is that when drought breaking catchment inflows occur, less volume is required to fill the storage, resulting in a greater spill volume in that event. Less of the natural catchment runoff is captured.

2.5 MANAGEMENT OBJECTIVES

The overall objective of the DST is to manage and optimise the use of the various raw water supplies in the system based on the "Five C's":

- Critical level
- Climate
- Controlling Spill
- Conditions
- Cost

Management of the water supply system will be on a year by year basis defined by a water year: 1 July to 30 June.

2.5.1 CRITICAL LEVEL

Water security in Orange is measured using the security of supply basis which results in a defined term called “Secure Yield”. The secure yield is considered to be the annual demand that can be supplied from the system while satisfying the following conditions:

a) Duration of restrictions does not exceed 5% of the time;

b) Frequency of restrictions does not exceed 10% of years (i.e. 1 year in 10 on average); and

c) Severity of restrictions does not exceed 10%. Systems must be able to meet 90% of the unrestricted water demand (i.e. 10% average reduction in consumption due to water restrictions) through a repetition of the worst recorded drought, commencing with the storage drawn down to the level at which restrictions need to be imposed to satisfy a) and b) above.

Secure yield is defined as the highest annual water demand that can be supplied from a water supply system while meeting the above 5/10/10 rule.

The secure yield approach seeks to provide schemes that are operationally satisfactory so that:

- restrictions are neither of excessive duration nor too frequent; and
- adequate capacity is available to allow the operating authority to manage the scheme during drought periods.
Secure yield analysis for the Orange system indicates that it is the federation drought that defines the secure yield. This is a 5.5 to 6 year period from 1894 to 1900 when the combined storage was below full supply level. Further, numerous analyses indicated that the restriction volume (the volume that satisfies the restriction frequency and duration criterion after which the 10% demand reduction is applied) was about 50% of the combined storage volume.

The secure yield analysis shows that the raw water supplies can provide a combined secure yield of 7,900 ML/year through the critical drought period while continuing to operate within their respective approved operating conditions and with the combined storage commencing at 50%.

Therefore 50% of the combined storage (11,700 ML) is defined as the critical level and the water supply system will be operated to ensure the combined storage is at or above this level at the end of each water year. This is defined at the “critical drought target”.

This means that if the system moves into a drought equivalent to the critical drought at the end of the current year, the system will be able to supply the volume indicated by the secure yield analysis with all external water sources operating in accordance with approval conditions.

This concept is demonstrated in Figure 4. This example assumes the combined storage is at 60% (14,000 ML) at the start of the water year being forecast. Input from external sources would be required to ensure the critical level is met in dry conditions.

**Figure 4:** Example of how the critical drought target works
The example shows that if the combined storage is at the critical level at the end of the water year being forecast, the system can supply water through the critical drought period with all external water sources operating in accordance with approval. It also indicates that the system should be able to cope with a drought worse than the drought on record.

A refinement to the end of year critical level will be made on a year by year basis by considering the previous 10 year restriction regime. This will help meet the restriction components of secure yield. For example, if restrictions have occurred over the past 10 years and the duration is greater than 5%, the end of year critical level target should be increased above the critical drought target to give the community some relief from restrictions. Nominating an end of year storage level to reduce restrictions is defined as the “restriction target”.

The DST objective relating to **Critical level** is operating the system to ensure that:

- the combined storage is at or above a defined critical level at the end of each water year – the **critical drought target**; and/or
- restriction regimes are consistent with the frequency and duration of restriction components of the 5/10/10 secure yield rule – the **restriction target**.

### 2.5.2 CLIMATE

Climatic factors effect both supply and demand. Dry periods reduce the volume of catchment runoff and, during periods of no restrictions, can cause higher water demand through increased outdoor water use. It is noted that when the combined storage is drawn down, water demand can be managed through the use of water restrictions.

The DST objective relating to **Climate** is to adopt operating rules based on expected climatic conditions.

#### 2.5.2.1 Climate Forecasts

The Bureau of Meteorology (BOM) run the Predictive Ocean Atmosphere Model for Australia (POAMA) which a dynamic computer model of the climate system. This model provides a nine month forecast of the El Niño – Southern Oscillation (ENSO) and Indian Ocean Dipole (IOD) which are used to predict if climate patterns will be dry, neutral or wet.

POAMA forecasts are updated every fortnight and included in monthly model summaries issued by the BOM. The POAMA forecast will be used at the start of each water year to identify the expected climatic conditions for the coming year (nine months initially). The POAMA forecast will be reviewed during the quarterly review.

The BOM also issue a three month climate outlook which includes the chance of receiving rainfall of defined depths. The BOM three month climate outlook will be reviewed during the quarterly review and compared to the three month average for the dry, neutral and wet years.
2.5.2.2 DST Definitions and Data

The DST includes consideration of forecast climate conditions as follows:

- Dry – 15<sup>th</sup> percentile annual rainfall
- Neutral – 50<sup>th</sup> percentile annual rainfall
- Wet – 85<sup>th</sup> percentile annual rainfall

Analysis of the Suma Park Dam catchment rainfall used in the Orange system water cycle model for these percentiles is presented in Table 2.1. These years will be used to assess storage behaviour for the water year analysis (refer to Section 3.3).

The quarterly review (refer to Section 3.4) will include consideration of the BOM three month rainfall outlook. As the water year analysis will be conducted in June each year, the first quarterly review will consider the October to December three month outlook; the second quarterly review will consider the January to March outlook; and the third quarterly review will consider the April to June outlook. The average rainfall depths recorded over these three month periods for the dry, neutral and wet years is provided in Table 2.2.

The BOM three month outlook will be used to estimate the chance of receiving the three month rainfall total for the year type (dry, neutral or wet) and period being considered. This will indicate if operating rules need to be changed.

For example, assuming the water year analysis determined that it will be a neutral year, the catchment could expect to receive around 260 mm in the October to December period. If the BOM three month outlook showed greater than a 65% (or higher) chance of receiving this rainfall depth, there would be no significant indicator to change the operating rules. However, if the three month outlook showed only a 25% chance of receiving this rainfall depth, it would be indicating drier than expected conditions and the operating rules could be modified.
Table 2.1 – Annual rainfall percentiles

<table>
<thead>
<tr>
<th>Percentile</th>
<th>Rainfall mm/year</th>
<th>Years with corresponding rainfall (within 2%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15th</td>
<td>653</td>
<td>• Model year 9 653 mm (1898/99)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Model year 40 652 mm (1929/30)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Model year 68 645 mm (1957/58)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Model year 90 660 mm (1979/80)</td>
</tr>
<tr>
<td>50th</td>
<td>846</td>
<td>• Model year 44 862 mm (1933/34)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Model year 53 841 mm (1942/43)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Model year 64 852 mm (1953/54)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Model year 88 854 mm (1977/78)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Model year 101 833 mm (1990/91)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Model year 115 850 mm (2004/05)</td>
</tr>
<tr>
<td>85th</td>
<td>1,047</td>
<td>• Model year 1 1047 mm (1890/91)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Model year 28 1040 mm (1917/18)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Model year 79 1052 mm (1968/69)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Model year 81 1043 mm (1970/71)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Model year 82 1031 mm (1971/72)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Model year 94 1067 mm (1983/84)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Model year 97 1043 mm (1986/87)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Model year 102 1068 mm (1991/92)</td>
</tr>
</tbody>
</table>

Table 2.2 – Three month rainfall totals

<table>
<thead>
<tr>
<th>Period</th>
<th>Dry</th>
<th>Neutral</th>
<th>Wet</th>
</tr>
</thead>
<tbody>
<tr>
<td>July to September</td>
<td>162 mm</td>
<td>270 mm</td>
<td>300 mm</td>
</tr>
<tr>
<td>October to December</td>
<td>141 mm</td>
<td>178 mm</td>
<td>284 mm</td>
</tr>
<tr>
<td>January to March</td>
<td>141 mm</td>
<td>215 mm</td>
<td>297 mm</td>
</tr>
<tr>
<td>April to June</td>
<td>185 mm</td>
<td>185 mm</td>
<td>167 mm</td>
</tr>
</tbody>
</table>

2.5.3 CONTROLLING SPILL

The lowest cost raw water comes from the catchment. Keeping the main supply reservoirs (Spring Creek Dam and Suma Park Dam) too full could result in spill of catchment runoff. The addition of external supplies to the storage needs to be balanced against the risk of the storage spilling or falling below the nominated critical level.

The DST objective relating to Controlling spill is to minimise spill from Suma Park Dam by operating the system cognisant of forecast climatic conditions and likely catchment inflow.

2.5.4 CONDITIONS

All of the raw water supplies schemes have been approved under relevant legislation and need to be operated in accordance with approval conditions. When operated in this manner (i.e. in
accordance with approval conditions), the raw water supply scheme can be deemed to have an insignificant impact on the environment.

Approvals under the Water Management Act 2000 and key operating rules relevant to the DST are listed in Table 2.3.

Table 2.3 – Summary of approvals and key operating rules for DST

<table>
<thead>
<tr>
<th>Source</th>
<th>Approvals</th>
<th>Key Operating Rules for DST</th>
</tr>
</thead>
</table>
| Catchment – Spring Creek Dam and Suma Park Dam | WAL36161 80CA722752 | - Combined extraction from Spring Creek Dam and Suma Park Dam limited to 7,800 ML  
- Comply with environmental flow rules through releases from Suma Park Dam in accordance with approval conditions |
| BSC Stormwater Harvesting | WAL36161 80WA723739 80WA723740 80SL096299(1) | - Harvest pumps must not operate if Suma Park Dam is at 100% of full storage capacity  
- Only operate when the flow in Blackmans Swamp Creek is greater than 1,000 L/s as measured at the gauge downstream of the harvest weir  
- Maximum extraction rate of 450 L/s at Pump Station 1  
- Cease extraction when the level in the weir pool is equal to or less than RL840.50 mAHD or the flow recorded at the gauge downstream of the harvest weir is equal to or less than 150 L/s, whichever occurs first |
| PC Stormwater Harvesting | WAL33891 80CA718056 | - Only operate when stormwater holding pond is less than 100% of full storage capacity  
- Pump Station 4: start when flow > 55 L/s; stop when flow < 5 L/s; maximum extraction rate = 50 L/s  
- Pump Station 5: start when flow > 20 L/s; stop when level in upstream wetland returns to normal water level; maximum extraction rate = 20 L/s  
- Pump Station 6: start when flow > 20 L/s; stop when flow < 2 L/s; maximum extraction rate = 20 L/s  
- Combined extraction limited to 700 ML |
| Bores – Showground/Margaret Street Depot | WAL29148 80CA715359 80BL245074 80BL245947 | - Extraction limit 280 ML |
| Bores – Clifton Grove | WAL30283 80CA715992 80BL245800 80BL245805 | - Extraction limit 182 ML |
| Macquarie River to Orange Pipeline | Project Approval(2) MP10_0235 18 June 2013 | - Only operate when:  
  o The flow in the Macquarie River is greater than 108 ML/day (plus gauging station margin of error)  
  o Suma Park Dam is less than 90% of full storage capacity  
- Transfer a maximum of 12 ML/day  
- Instantaneous extraction of 15.2 ML/day (176 L/s) |

(1) Conditions from the surface licence (SL) issued under the Water Act 1912 apply until such time that they are converted to the Water Management Act 2000

(2) The Macquarie River to Orange Pipeline approved by the Minister of Planning therefore no works approval issued. Pipeline to be operated in accordance with the Project Approval.
For the external water sources (stormwater harvesting, bores and Macquarie River) the key operating rules represent the upper limits for the operation of these schemes. These sources do not necessarily have to be operated in this manner each year; they can range up or down within the upper limits, but cannot be operated beyond the upper limits. For example, and depending on the year being forecast:

- The Macquarie Pipeline may be operated at 6 ML/day when Suma Park Dam is less than 70% of full storage capacity and flow in the Macquarie river is greater than 108 ML/day; or
- Stormwater harvesting may be triggered when Suma Park Dam is less than 90% of full storage capacity; or
- The full groundwater entitlement may not be used from the bores.

Orange City Council holds a 643 ML/year unregulated water access licence for the extraction of water from the Macquarie River. If the water year analysis undertaken in accordance with this DST (refer to Section 3.3) indicates it is likely more than this volume will be extracted during the water year, Council will make an application for a water allocation assignment under Section 71T of the Water Management Act, 2000. Extraction of water will still be undertaken in accordance with the Project Approval conditions (refer to Table 2.3) and no extraction greater than 643 ML/year will occur without the water assignment being in place.

The DST objective relating to Conditions is to ensure all raw water supplies are operated in accordance with relevant approval conditions.

### 2.5.5 COST

Each of the external water sources have different operating costs. Further, each scheme can be operated using different rules or operating regimes which alters the unit cost of providing water (measured in $ per kilolitre).

The DST only considers variable operating costs (e.g. electricity and water treatment costs) as the capital, depreciation and fixed operating costs have been, or will be, incurred regardless of whether the water source is used. For example, the fixed operating costs of inspecting and maintaining the Macquarie River to Orange Pipeline and undertaking monitoring and reporting will be incurred each year regardless of whether the pipeline is used.

It is also assumed that water supplied from the catchment (i.e. water captured in Suma Park and Spring Creek dams) has zero operating cost. Therefore only external water sources that add water to Suma Park Dam need to be considered in terms of their relative cost. These are the “taps” that can be turned on or off.

Each external water source has various rules and operating parameters that can be altered to change the amount of water supplied and the operating costs. A summary of the rules and operating parameters that can be changed is provided in Table 2.4.
### Table 2.4 – Operating rules and parameters that can change the volume of water supplied

<table>
<thead>
<tr>
<th>Source</th>
<th>Rules</th>
<th>Operations</th>
</tr>
</thead>
</table>
| BSC Stormwater Harvesting          | • The storage level in Suma Park Dam below which harvesting can commence | • The number of harvest pumps used for extraction: i.e. using one or two pumps at PS1  
  • Operating the treatment system during off-peak power tariff periods only (i.e. 9 hours per day) |
| PC Stormwater Harvesting           | • The storage level in Suma Park Dam below which harvesting can commence | • The number of harvest pumps used for extraction: i.e. using one or two pumps at PS4, PS5 and PS6  
  • Operating the harvest pumps (PS4, PS5 and PS6) in off peak periods only  
  • Operating the treatment system during off-peak power tariff periods only (i.e. 9 hours per day) |
| Bores – Showground/Margaret Street Depot | • Maximum extraction 280 ML                                           | • Operating pumps in off peak periods only  
  • Changing the number of pump hours each day |
| Bores – Clifton Grove              | • Maximum extraction 182 ML                                           | • Changing the number of pump hours each day |
| Macquarie River to Orange Pipeline | • The maximum storage level in Suma Park Dam below which transfer can commence  
  • The minimum river flow above which pumping can commence | • Changing the number of pump hours each day  
  • Using one or two pumps at each pump station  
  • The storage level in Suma Park Dam (once <90%) |

In terms of operations:

- The Macquarie River to Orange Pipeline can be operated in off peak power tariff periods (9 hours weekdays and 19 hours on weekend days) only (if required) due to the length of hydrographs in the Macquarie River.

- It is not feasible to limit the Blackmans Swamp Creek stormwater harvesting scheme harvest pump station (PS1) to off peak periods as the urban runoff hydrographs are relatively short and can occur at any time during a day. The Ploughmans Creek harvest pump stations (PS4, PS5 and PS6) could be operated in off peak periods as the wetlands extend the runoff hydrograph over several days.

- The stormwater harvesting treatment system can be controlled to operate only in off peak periods or 24/7.

- The Clifton Grove bores can be limited to off peak periods while still accessing the full entitlement.

- The Showground bore needs to operate in some shoulder periods to access the full entitlement. Limiting the Showground bore to off peak periods only would reduce the annual volume extracted to 194 ML (69% of the full entitlement) and save $4,500 in electricity charges.
A range of operating options have been assessed to determine the average annual volume of water supplied and the unit cost of water from each source. The “rules” component was not changed for this assessment; only the operational parameters as listed in Table 2.4. Results are summarised on Figure 5 and Figure 6.

Scheme naming convention as follows.

- Stormwater harvesting:
  - PC = Ploughmans Creek only
  - BSC = Blackmans Swamp Creek only
  - SHS = both harvesting schemes operating
  - One pump = only one harvest pump operating at each harvest point (this halves the harvest rate)
  - Two pumps = two harvest pumps operating at each harvest point
  - Off peak = treatment system (PS2 and PS3) operating only in off peak periods only
  - Full off peak = PC harvest pumps (PS4, PS5 and PS6) and treatment system (PS2 and PS3) operating in off peak periods only

- Macquarie River to Orange Pipeline:
  - MOP1 = one pump operating at each pump station transferring a maximum of 6 ML/day
  - MOP2 = two pumps operating at each pump station transferring a maximum of 12 ML/day
  - X/Y = weekday pumping hours/weekend pumping hours

Figure 5 shows that the bores supply the lowest cost water, followed by off peak stormwater harvesting (in various operating regimes), full operation of the stormwater harvesting schemes and then the Macquarie River to Orange Pipeline, with operating regimes that yield higher quantities having a lower unit cost.

This indicates a cost preference for the bores and stormwater harvesting over the Macquarie River to Orange Pipeline. The Macquarie River to Orange Pipeline assessment indicates that once it is turned on, it is more cost effective to use it in full off peak operation (i.e. MOP2-9/19).

Figure 6 shows the average annual volume supplied for each of the schemes and operating regimes assessed. These are shown in the same order as the ranked variable costs.

If an additional 400 ML/year is required to meet the critical level condition, the lowest cost option would be the bores. If an additional 800 ML/year is required this could be supplied by the stormwater harvesting schemes operating with two harvest pumps in off peak periods. Or, it could be a combination of bores plus Ploughmans Creek one pump harvesting in off peak periods.
Figure 5: External supplies ranked in order of variable operating cost
Figure 6: Average volume of water supplied
Assessment of the Macquarie River to Orange Pipeline power costs indicates that once it is turned on, it is more cost effective to use it in full off peak operation (i.e. MOP2-9/19). This is demonstrated in Figure 7 which shows a range of operating rules using 1 and 2 pumps. The lower bound of this set of curves represents the lowest power cost for the volume supplied.

![Figure 7: MOP power costs vs volume supplied](image)

The average annual volume supplied by the external sources in the dry, neutral and wet years identified in Section 2.5.2 are shown in Figures 8, 9 and 10 respectively.

Once the climate forecast is known, these plots can be used to identify which options could be used.

It is noted that less water is supplied in the wet years as the system storage typically fills during the year.

There are many combinations available; however the main objective will be to use the lowest cost water first. A computer base optimisation tool is being developed by Adelaide University in conjunction with Orange City Council to assist with the analysis of supply options. It is expected this tool will be available in 2016; the analysis will be undertaken using existing models until this tool is available.

The DST objective relating to Cost is to minimise the cost of the raw water supply by adopting operating rules that use the lowest cost water first.
Figure 8: Average volume of water supplied in dry years
Figure 9: Average volume of water supplied in neutral years
Figure 10: Average volume of water supplied in wet years
Decision Support Tool

3.1 OPERATING YEAR

The operating year is defined as 1 July to 30 June.

This is to be consistent with the water year as used by the NSW Department of Industry – Water (DoI Water) for reporting under the Water Management Act 2000.

3.2 DST STRUCTURE AND APPLICATION

The DST tool has three elements:

- Element 1: analysis of the upcoming water year, identification of the critical level and definition of operating rules to meet the critical level at the end of the water year based on climate indicators;
- Element 2: quarterly review and adjustment of the operating rules based on consideration of demand and climate indicators; and
- Element 3: record keeping and reporting.

3.3 ELEMENT 1: WATER YEAR ANALYSIS

When: Completed in July each year.

Actions: 1 Collate and analyse data including:

- annual water demand for the current water year
- forecast storage at the end of the current water year
- the restriction regime over the preceding 10 years
- any water transfer requests from Central Tablelands Water and/or Cabonne Council

2 Determine the critical level for the end of the next water year and identify if this is a critical drought target or a restriction target.

3 Review POAMA forecasts available from the Bureau of Meteorology [http://www.bom.gov.au/climate/poama2.4/poama.shtml] and determine if the next water year should be modelled as dry, neutral or wet. Other long term weather forecast (e.g. BOM 3 month rainfall...
outlook, Elders Weather 12 month rainfall, Farm online, Weatherzone) can be used to provide further evidence for the water year analysis.

4 Determine the expected annual water demand for the next water year based on consideration of the POAMA forecast and historic demand.

5 Model the water supply system over the next water year with no external water sources (i.e. catchment surface water only) under the relevant climate condition.

6 Identify the shortfall (if any) between the modelled storage at the end of the water year and the critical level identified in Action 2.

7 If a shortfall is identified in Action 6, assess how this shortfall can be met using available water sources. Optimise the operating rules to achieve the lowest cost solution.

8 Determine and record the margin of error to be applied at Gauging Station 421192 (Macquarie River downstream of Long Point - pump offtake point) in consultation with DoI Water hydrometric branch (refer to PA condition B6).

9 Document the water year analysis using Form DST-01.

10 If the estimated volume of water being extracted from the Macquarie River is greater than 643 ML/year, the Water and Sewer Strategic Manager shall:
   • determine if any carryover is available from the previous water year; and
   • make application for an assignment of water allocation (temporary transfer) to DoI Water.

The volume of the temporary assignment will be recorded on Form DST-01.

11 Submit the water year analysis to the Director of Technical Services for approval.

12 Disseminate the approved operating rules for the next water year to relevant OCC operational staff including:
   • Water Treatment Manager
   • Water Treatment Supervisor

13 Ensure the approved operating rules are published on OCC’s website in accordance with OEMP Section 4.5 – Access to Information.
14 Ensure that the assignment of water allocation is approved before taking more than 643 ML/year from the Macquarie river.

15 The Water Treatment Manager must ensure the raw water supply system is operated in accordance with the approved operating rules.

16 Contact Central Tablelands Water and Cabonne Council for demands.

Who: The Water and Sewerage Strategic Manager shall be responsible for:

- Undertaking or coordinating the water year analysis as defined in Actions 1 to 10
- Seeking approval from the Director Technical Services (Action 11)
- Disseminating the approved operating rules (Action 12)
- Ensuring operating rules are published on OCC web site (Action 13)
- Making application to DoI water for an assignment of water allocation if required (Action 14)
- Ensuring the assignment of water allocation is in place before exceeding 643 ML/year extraction from the Macquarie River (Action 14)
- Keeping records of the water year analysis

The Director of Technical Services shall be responsible for reviewing the assessment and approving the proposed operating rules.

The Water Treatment Manager shall be responsible for ensuring raw water supply system is operated in accordance with the approved operating rules.

Records: A record of the water year analysis will be maintained using Form DST-01.
3.4 ELEMENT 2: QUARTERLY REVIEW

When: Completed in early October, January and April each year.

Actions:

1. Collate and analyse data including:
   - water storage trends
   - water demand trends
   - any water transfer requests from Central Tablelands Water and/or Cabonne Council
   - any changes in operating rules adopted in the previous three months due to changes in conditions or in response to water quality issues

2. Determine if the water storage is tracking as expected.


4. Review the Bureau of Meteorology three month rainfall outlook [http://www.bom.gov.au/climate/outlooks/#/rainfall/exceedance/150/seasonal/0] and compare the chance of receiving the three month rainfall total for the year type (dry, neutral or wet) and period being considered (refer to data in Table 2.2).

Other long term weather forecast (e.g. Elders Weather 12 month rainfall, Farm online, Weatherzone) can be used to provide further evidence for the quarterly analysis.

5. Determine if any external water supply currently being used will be off-line, or scheduled to be off-line, for some reason relating to either maintenance or some other requirement.

6. Review any actions arising from the latest Annual Review that may require alteration to operation rules (refer to Section 4.4 – OEMP Reporting).

7. Review operating rules as required:
   - If the system is tracking as forecast in the water year analysis and indicators are for the same conditions to continue, rules will remain unchanged.
   - If the system is tracking below forecast and indicators are for drier conditions, rules will be modified to increase external transfers.
   - If the system is tracking above forecast and indicators are for wetter conditions, rules will be modified to decrease external transfers.
Determine and record the margin of error to be applied Station 421192 (Macquarie River downstream of Long Point - pump offtake point) in consultation with DoI Water hydrometric branch (refer to PA CoA B6).

Review the need for a water assignment to cover extraction from the Macquarie River. Cancel if not required. A request to cancel the transfer shall be made in writing to DoI Water. Otherwise ensure that the assignment of water allocation is approved before taking more than 643 ML/year from the Macquarie River. Record action on Form DST-02.

Document the quarterly review using Form DST-02.

Submit the quarterly review to the Director of Technical Services for approval.

Disseminate the approved operating rules for the next water year to relevant OCC operational staff including:
- Water Treatment Manager
- Water Treatment Supervisor

Ensure the approved operating rules are published on OCC’s website in accordance with OEMP Section 4.5 – Access to Information.

The Water Treatment Manager must ensure the raw water supply system is operated in accordance with the approved operating rules.

Contact Central Tablelands Water and Cabonne Council for demands.

Who:
The Water and Sewerage Strategic Manager shall be responsible for:
- Undertaking or coordinating the quarterly review as defined in Actions 1 to 10
- Seeking approval from the Director Technical Services (Action 11)
- Disseminating the approved quarterly review (Action 12)
- Ensuring operating rules are published on OCC web site (Action 13)
- Keeping records of the quarterly review

The Director of Technical Services shall be responsible for reviewing and approving the quarterly review.

The Water Treatment Manager shall be responsible for ensuring raw water supply system is operated in accordance with the approved operating rules.

Records: A record of the quarterly review will be maintained using Form DST-02.
3.5 ELEMENT 3: RECORDS AND REPORTING

3.5.1 RECORDS

Council will maintain the following records:

- Water year analysis on Form DST-01
- Quarterly review on Form DST-02

Where a model is used, a digital version of the model will be saved for each water year.

3.5.2 REPORTING

Reporting will be in accordance with Attachment E: Hydrology Monitoring Program.

Full OEMP reporting requirements and report dissemination are described in Section 4.4 – OEMP Reporting.

3.6 DST REVIEW

3.6.1 REVISION TO STRATEGIES, PLANS AND PROGRAMS

CoA C6 requires that OCC shall review, and if necessary revise, strategies, plans and programs included in the OEMP to the satisfaction of the Director-General within 3 months of:

a) the Annual Review (Section 4.4 – OEMP Reporting);
b) any Incident Report (Section 3.2.18 – Environmental Incident Management);
c) an Audit Report (Section 4.3 – Environmental Auditing and Compliance); or
d) any modification to the conditions of the Project Approval,

This is to ensure that plans and programs are updated on a regular basis, and incorporate any recommended measures to improve environmental performance.

3.6.2 DOCUMENT CONTROL

The following will be classed as ‘major’ revisions:

- Changes to processes;
- Changes to monitoring programs, either timing or parameters monitored;
- Changes made in response to an incident; and/or
- Changes requested by a relevant Government agency.

Major revisions will be identified by the whole number in the version number (i.e. 1.0, 2.0, 3.0,...) and will be reviewed, approved and re-circulated as necessary.
The following will be classed as ‘minor’ revisions:

- Minor typing and grammar corrections;
- Changes to position titles; and
- Updates to recording forms to suit changes in operations.

Minor revisions will be identified by the decimal point in the version number (i.e. 1.1, 2.2, 3.3...) and will not require review and approval prior to re-circulation.

Major and minor revisions will be listed in the Revision History at the front of this document.

3.7 CHANGES TO OPERATING RULES

Project Approval CoA B5 relates to the possible changes to the Macquarie River to Orange Pipeline operating rules based on consideration of further river flow data, modelling and stream gauging. Refer to Attachment K: Management Studies.

If Orange City Council progress this assessment, any revised operating rules will be incorporated into this DST.

These changes would be classed as a ‘major’ revision.
DST Example

4.1 INTRODUCTION

This section of the DST provides an example of how the DST may be implemented in dry, neutral and wet conditions. It is informative only as the application of the DST will be dynamic and each year will be different depending on the starting storage level, the defined critical level, and water demand and climate conditions.

For this example it is assumed:

- The combined water storage at the start of the water year being forecast is 14,000 ML (60%); and
- The unrestricted water demand is 5,400 ML/year (this would be reduced as Level 2 restrictions would be in place with the combined storage between 60% and 70%).

4.2 DRY YEAR

The dry year analysis is shown in Figure 11.

The adopted critical level is 11,700 ML (critical drought target). It is assumed the restriction regime has satisfied the frequency and duration rules over the past 10 years so no storage increase is required to meet a restriction target.

Under dry conditions, the combined storage is forecast to fall to around 9,000 ML at the end of the water year with catchment runoff only. External supplies are required to meet the adopted critical level.

External supplies are added in the order of: bores; stormwater harvesting; and Macquarie River.

The final operating rules adopted are summarised below the chart and the volume of raw water supplied to the Orange water supply system summarised in Table 4.1.

The assessment shows that all three external sources are required with:

- Bores extracting the full entitlement;
- The two stormwater harvesting schemes operating 24/7; and
- The Macquarie River to Orange pipeline operating in off peak hours when the river flow is greater than 108 ML/day.

The example water year analysis report is included in Appendix A.
Figure 11: Dry year example

<table>
<thead>
<tr>
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<th>Required?</th>
<th>Operating Rules</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Showground Bores</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SPD Trigger</td>
<td>Annual Transfer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ML/year</td>
</tr>
<tr>
<td></td>
<td>100%</td>
<td>280</td>
</tr>
<tr>
<td>Clifton Grove Bores (Shearing Shed and</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Bore No. 5)</td>
<td>SPD Trigger</td>
<td>Annual Transfer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ML/year</td>
</tr>
<tr>
<td></td>
<td>100%</td>
<td>182</td>
</tr>
<tr>
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<td></td>
</tr>
<tr>
<td>pumps at each pump station shown)</td>
<td>SPD Trigger</td>
<td>PS1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>100%</td>
<td>24/7</td>
</tr>
<tr>
<td>Macquarie River</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>SPD Trigger</td>
<td>River Flow</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Trigger</td>
</tr>
<tr>
<td></td>
<td>90%</td>
<td>108 ML/day</td>
</tr>
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</table>

Note: 24/7 means that the pumps can operate at any time triggered by runoff events
4.3 NEUTRAL YEAR: CRITICAL DROUGHT TARGET

The neutral year, critical drought target analysis is shown in Figure 12.

The adopted critical level is 11,700 ML (critical drought target). It is assumed the restriction regime has satisfied the frequency and duration rules over the past 10 years so no storage increase is required to meet a restriction target.

Under neutral conditions, the combined storage is forecast to be around 16,800 ML at the end of the water year with catchment runoff only. External supplies are therefore not required to meet the adopted critical level.

The final operating rules adopted are summarised below the chart and the volume of raw water supplied to the Orange water supply system summarised in Table 4.2.

In this example, the storage just reaches the level at which there would be no water restrictions (>70%). External water sources could have been used to move the community out of restrictions earlier if there had been excessive restrictions in the previous 10 years (refer to next example).

The example water year analysis report is included in Appendix A.

### Table 4.1 – Bulk water supplied to Orange system – dry year example

<table>
<thead>
<tr>
<th>Quarter</th>
<th>Catchment Only, ML</th>
<th>With Proposed Operating Rules, ML</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>921</td>
<td>939</td>
</tr>
<tr>
<td>2</td>
<td>1088</td>
<td>1181</td>
</tr>
<tr>
<td>3</td>
<td>1085</td>
<td>1329</td>
</tr>
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<td>4</td>
<td>921</td>
<td>953</td>
</tr>
<tr>
<td>Total</td>
<td>4015</td>
<td>4402</td>
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Figure 12: Neutral year example – critical drought target

<table>
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<th>Source</th>
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<th>Operating Rules</th>
</tr>
</thead>
<tbody>
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<td>Yes</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Showground Bores</td>
<td>✓</td>
<td>SPD Trigger, Annual Transfer ML/year, Weekday Pump Hours, Weekend Pump Hours</td>
</tr>
<tr>
<td></td>
<td>N/A</td>
<td>Nil</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Clifton Grove Bores (Shearing Shed and Bore No. 5)</td>
<td>✓</td>
<td>SPD Trigger, Annual Transfer ML/year, Weekday Pump Hours, Weekend Pump Hours</td>
</tr>
<tr>
<td></td>
<td>N/A</td>
<td>Nil</td>
</tr>
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<td></td>
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</tr>
<tr>
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<td>SPD Trigger, PS1, PS2, PS3, PS4, PS5, PS6</td>
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<td>Off</td>
</tr>
<tr>
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<td></td>
</tr>
<tr>
<td>Macquarie River</td>
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<td>SPD Trigger, River Flow Trigger, No. of Pumps, Weekday Pump Hours, Weekend Pump Hours</td>
</tr>
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<td></td>
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<td></td>
<td>0</td>
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</table>
4.4 NEUTRAL YEAR: RESTRICTION TARGET

The neutral year, restriction target analysis is shown in Figure 13.

In this example, the community has been on restrictions for too long so a decision is made to increase the combined storage to 80%. Therefore, the adopted critical level is 18,700 ML (restriction target).

Under neutral conditions, the combined storage is forecast to be around 16,800 ML at the end of the water year with catchment runoff only. External supplies are required to meet the adopted critical level.

The final operating rules adopted are summarised below the chart and the volume of raw water supplied to the Orange water supply system summarised in Table 4.3.

The assessment shows that two external sources are required with:

- Bores extracting the full entitlement; and
- The two stormwater harvesting schemes operating 24/7.

The example water year analysis report is included in Appendix A.

<table>
<thead>
<tr>
<th>Table 4.3 – Bulk water supplied to Orange system – neutral year, restriction target example</th>
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</thead>
<tbody>
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<td>Quarter</td>
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<td>3</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>Total</td>
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### Figure 13: Neutral year example – restriction target

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<td></td>
<td></td>
<td>Annual Transfer ML/year</td>
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<tr>
<td></td>
<td></td>
<td>Weekday Pump Hours</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Weekend Pump Hours</td>
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<tr>
<td></td>
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</tr>
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</tr>
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<tr>
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</tr>
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</table>

Note: 24/7 means that the pumps can operate at any time triggered by runoff events
4.5 WET YEAR

The wet year analysis is shown in Figure 14.

The adopted critical level is 11,700 ML (critical drought target).

Under wet conditions, the combined storage is forecast to be around 20,500 ML at the end of the water year with catchment runoff only. External supplies are therefore not required to meet the adopted critical level.

The final operating rules adopted are summarised below the chart and the volume of raw water supplied to the Orange water supply system summarised in Table 4.4.

The example water year analysis report is included in Appendix A.

<table>
<thead>
<tr>
<th>Quarter</th>
<th>Catchment Only, ML</th>
<th>With Proposed Operating Rules, ML</th>
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</thead>
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<td>Total</td>
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</table>
Figure 14: Wet year example

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<td></td>
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<td>Annual Transfer</td>
<td>Weekday Pump</td>
<td>Weekend Pump</td>
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<td>Hours</td>
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</tr>
<tr>
<td>Clifton Grove Bores (Shearing Shed and</td>
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<td></td>
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<td>Hours</td>
<td>Hours</td>
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<td>Nil</td>
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<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stormwater Harvesting (no. of operating</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pumps at each pump station shown)</td>
<td></td>
<td>SPD Trigger</td>
<td>PS1</td>
<td>PS2</td>
<td>PS3</td>
<td>PS4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>N/A</td>
<td>Off</td>
<td>Off</td>
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<td></td>
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<td>✔</td>
<td></td>
<td>River Flow</td>
<td>No. of Pumps</td>
<td>Weekday Pump</td>
<td>Weekend Pump</td>
</tr>
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<td>Trigger</td>
<td></td>
<td>Hours</td>
<td>Hours</td>
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<td>Yes</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>0</td>
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<td>No</td>
<td></td>
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<td></td>
<td></td>
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</tbody>
</table>
Forms
# Form DST-01: Water Year Analysis

**WATER YEAR BEING FORECAST:** 1 July ______________ to 30 June ______________

**DATA:**
- Annual water demand for previous water year ______________ ML
- Number of restriction periods in past 10 years ______________
- Number days of restrictions over past 10 years ______________ (1)
- Duration of restriction over past 10 years (1)/3650 ______________ %

**FORECASTING:**
- Forecast storage end of current water year ______________ ML
- POAMA forecast (circle) DRY NEUTRAL WET
- Forecast annual unrestricted water demand ______________ ML
- Forecast shortfall (see graph) ______________ ML
- External supplies required (circle)? YES NO

**CRITICAL LEVEL:**
- Critical level for end of forecast water year ______________ ML
- Critical drought target ☐ or Restriction target ☐

---

**Figure 1:** Modelled storage behaviour for adopted POAMA forecast
PROPOSED OPERATING RULES FOR FORECAST WATER YEAR:

<table>
<thead>
<tr>
<th>Source</th>
<th>Required?</th>
<th>Operating Rules</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Showground Bores</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clifton Grove Bores (Shearing Shed and Bore No. 5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stormwater Harvesting (no. of operating pumps at each pump station shown)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Macquarie River</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Macquarie River margin of error to apply to flow trigger: _____________

FORECAST WATER DEMAND:

<table>
<thead>
<tr>
<th></th>
<th>1st Quarter</th>
<th>2nd Quarter</th>
<th>3rd Quarter</th>
<th>4th Quarter</th>
</tr>
</thead>
</table>

MACQUARIE RIVER: Average water transferred from Macquarie River _____________ ML

Is water assignment required? YES NO

If yes, volume required _____________ ML

Date DPI Water advised _____________

APPROVAL:

Prepared by:

Water and Sewerage Strategic Manager: Signature: Date:

Reviewed and authorised by:

Director Technical Services: Signature: Date:
Form DST-02: Quarterly Review

WATER YEAR: 1 July ___________ to 30 June ___________

REVIEW DATE: ____________________________

FORECAST AND ACTUAL WATER DEMAND:

<table>
<thead>
<tr>
<th></th>
<th>1st Quarter</th>
<th>2nd Quarter</th>
<th>3rd Quarter</th>
<th>4th Quarter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forecast, ML</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Actual, ML</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

REVIEW:

Storage tracking (see graph)

POAMA forecast (circle) DRY NEUTRAL WET

BOM three month rainfall outlook

<table>
<thead>
<tr>
<th>3 month rainfall</th>
<th>10mm</th>
<th>25mm</th>
<th>50mm</th>
<th>100mm</th>
<th>150mm</th>
<th>200mm</th>
<th>250mm</th>
<th>300mm</th>
<th>400mm</th>
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</thead>
<tbody>
<tr>
<td>Chance of exceeding</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 1: Modelled and actual storage behaviour
**ANY OPERATIONAL CONSIDERATIONS?**

---

**ANY ACTIONS FROM ANNUAL REPORT?**

---

**DO THE RULES NEED TO BE MODIFIED** (circle)?

<table>
<thead>
<tr>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
</table>

Macquarie River margin of error to apply to flow trigger: ________________

Is water assignment from Macquarie River still required?  
<table>
<thead>
<tr>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
</table>

If no, date DPI Water advised ________________

**REVISED OPERATING RULES BASED ON QUARTERLY REVIEW:**

<table>
<thead>
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<th>Required?</th>
<th>Operating Rules</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Showground Bores</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clifton Grove Bores (Shearing Shed and Bore No. 5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stormwater Harvesting (no. of operating pumps at each pump station shown)</td>
<td></td>
<td>SPD Trigger</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Macquarie River</td>
<td></td>
<td>SPD Trigger</td>
</tr>
</tbody>
</table>

**APPROVAL:**

Prepared by:

Water and Sewerage Strategic Manager: Signature: Date:

Reviewed and authorised by:

Director Technical Services: Signature: Date:
Appendix A: Example Water Year Analysis
Form DST-01: Water Year Analysis

WATER YEAR BEING FORECAST: 1 July 2015 to 30 June 2016

DATA:
- Annual water demand for previous water year: 4900 ML
- Number of restriction periods in past 10 years: 1
- Number days of restrictions over past 10 years: 120 (1)
- Duration of restriction over past 10 years (1)/3650: 3.3%

FORECASTING:
- Forecast storage end of current water year: 14000 ML
- POAMA forecast (circle): DRY
- Forecast unrestricted annual water demand: 5400 ML
- Forecast shortfall (see graph): 2700 ML
- External supplies required (circle)? YES

CRITICAL LEVEL:
- Critical level for end of forecast water year: 11700 ML
- Critical drought target: ✓ or Restriction target: 

Figure 1: Modelled storage behaviour for adopted POAMA forecast
## PROPOSED OPERATING RULES FOR FORECAST WATER YEAR:

<table>
<thead>
<tr>
<th>Source</th>
<th>Required?</th>
<th>Operating Rules</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>SPD Trigger</td>
<td>Annual Transfer ML/year</td>
</tr>
<tr>
<td><strong>Showground Bores</strong></td>
<td>✓</td>
<td>100%</td>
<td>280</td>
</tr>
<tr>
<td><strong>Clifton Grove Bores (Shearing Shed and Bore No. 5)</strong></td>
<td>✓</td>
<td>100%</td>
<td>182</td>
</tr>
<tr>
<td><strong>Stormwater Harvesting</strong></td>
<td>✓</td>
<td>100%</td>
<td>24/7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PS1</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PS2</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PS3</td>
<td>2</td>
</tr>
<tr>
<td></td>
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<td>PS4</td>
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<td></td>
<td></td>
<td>PS5</td>
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<td></td>
<td></td>
<td>PS6</td>
<td>2</td>
</tr>
<tr>
<td><strong>Macquarie River</strong></td>
<td>✓</td>
<td>90%</td>
<td>108 ML/day</td>
</tr>
</tbody>
</table>

Macquarie River margin of error to apply to flow trigger: __10%__ therefore: **119 ML/day**

## FORECAST WATER DEMAND:

<table>
<thead>
<tr>
<th>1st Quarter</th>
<th>2nd Quarter</th>
<th>3rd Quarter</th>
<th>4th Quarter</th>
</tr>
</thead>
<tbody>
<tr>
<td>939</td>
<td>1181</td>
<td>1329</td>
<td>953</td>
</tr>
</tbody>
</table>

**MACQUARIE RIVER:**

- Average water transferred from Macquarie River: **1545** ML
- Is temporary licence volume transfer required? **YES**
- If yes, transfer volume required: **1000** ML
- Date NSW Office of Water advised: **30 June 2015**

## APPROVAL:

Prepared by:

<table>
<thead>
<tr>
<th>Water and Sewerage Strategic Manager:</th>
<th>Signature:</th>
<th>Date:</th>
</tr>
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</table>

Reviewed and authorised by:

<table>
<thead>
<tr>
<th>Director Technical Services:</th>
<th>Signature:</th>
<th>Date:</th>
</tr>
</thead>
</table>
Form DST-01: Water Year Analysis

WATER YEAR BEING FORECAST: 1 July 2015 to 30 June 2016

DATA:
- Annual water demand for previous water year: 4900 ML
- Number of restriction periods in past 10 years: 1
- Number days of restrictions over past 10 years: 120 (1)
- Duration of restriction over past 10 years (1)/3650: 3.3 %

FORECASTING:
- Forecast storage end of current water year: 14000 ML
- POAMA forecast (circle): DRY, NEUTRAL, WET
- Forecast unrestricted annual water demand: 5400 ML
- Forecast shortfall (see graph): nil ML
- External supplies required (circle)? YES, NO

CRITICAL LEVEL:
- Critical level for end of forecast water year: 11700 ML
- Critical drought target: ✔ or Restriction target: □

Figure 1: Modelled storage behaviour for adopted POAMA forecast
## Proposed Operating Rules for Forecast Water Year:

<table>
<thead>
<tr>
<th>Source</th>
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<th>Operating Rules</th>
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<tr>
<td></td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Showground Bore</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Clifton Grove Bore (Shearing Shed and Bore No. 5)</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Stormwater Harvesting (no. of operating pumps at each pump station shown)</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Macquarie River</td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>

Macquarie river margin of error to apply to flow trigger: na

## Forecast Water Demand:

<table>
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<tr>
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<th>2nd</th>
<th>3rd</th>
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<tbody>
<tr>
<td></td>
<td>995</td>
<td>1382</td>
<td>1661</td>
<td>1146</td>
</tr>
</tbody>
</table>

## Macquarie River:

- Average water transferred from Macquarie River: nil ML
- Is temporary licence volume transfer required? YES
- If yes, transfer volume required: nil ML

## Approval:

Prepared by:

**Water and Sewerage Strategic Manager:**

**Signature:**

**Date:**

Reviewed and authorised by:

**Director Technical Services:**

**Signature:**

**Date:**
Form DST-01: Water Year Analysis

WATER YEAR BEING FORECAST: 1 July 2015 to 30 June 2016

DATA:
- Annual water demand for previous water year: 4900 ML
- Number of restriction periods in past 10 years: 3
- Number of days of restrictions over past 10 years: 292 (1)
- Duration of restriction over past 10 years (1)/3650: 8.0%

FORECASTING:
- Forecast storage end of current water year: 14000 ML
- POAMA forecast (circle): DRY NEUTRAL WET
- Forecast unrestricted annual water demand: 5400 ML
- Forecast shortfall (see graph): 1100 ML
- External supplies required (circle)? YES NO

CRITICAL LEVEL:
- Critical level for end of forecast water year: 18700 ML
- Critical drought target: [ ] or Restriction target: [ ]

Figure 1: Modelled storage behaviour for adopted POAMA forecast
PROPOSED OPERATING RULES FOR FORECAST WATER YEAR:

<table>
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<th>Source</th>
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<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Showground Bores</td>
<td>✓</td>
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<td></td>
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</tr>
<tr>
<td>Clifton Grove Bores (Shearing Shed and Bore No. 5)</td>
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<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stormwater Harvesting (no. of operating pumps at each pump station shown)</td>
<td>✓</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Macquarie River</td>
<td>✓</td>
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Macquarie river margin of error to apply to flow trigger: na

FORECAST WATER DEMAND:

<table>
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<th></th>
<th>1st Quarter</th>
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<th>3rd Quarter</th>
<th>4th Quarter</th>
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<td>1005</td>
<td>1404</td>
<td>1698</td>
<td>1186</td>
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</table>

MACQUARIE RIVER: Average water transferred from Macquarie River: nil ML

Is temporary licence volume transfer required? YES

If yes, transfer volume required: NO

Date NSW Office of Water advised: 

APPROVAL:

Prepared by:
Water and Sewerage Strategic Manager: Signature: Date:

Reviewed and authorised by:
Director Technical Services: Signature: Date:
Form DST-01: Water Year Analysis

WATER YEAR BEING FORECAST: 1 July 2015 to 30 June 2016

DATA:
- Annual water demand for previous water year: 4900 ML
- Number of restriction periods in past 10 years: 1
- Number of days of restrictions over past 10 years: 120 (1)
- Duration of restriction over past 10 years (1)/3650: 3.3 %

FORECASTING:
- Forecast storage end of current water year: 14000 ML
- POAMA forecast (circle): DRY, NEUTRAL, WET
- Forecast unrestricted annual water demand: 5400 ML
- Forecast shortfall (see graph): nil ML
- External supplies required (circle)? YES

CRITICAL LEVEL:
- Critical level for end of forecast water year: 11700 ML
- Critical drought target: ✔️
- Restriction target: ❌

Figure 1: Modelled storage behaviour for adopted POAMA forecast
### PROPOSED OPERATING RULES FOR FORECAST WATER YEAR:

<table>
<thead>
<tr>
<th>Source</th>
<th>Required?</th>
<th>Operating Rules</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Showground Bores</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Clifton Grove Bores (Shearing Shed and Bore No. 5)</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Stormwater Harvesting (no. of operating pumps at each pump station shown)</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Macquarie River</td>
<td>✓</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>SPD Trigger</th>
<th>Annual Transfer ML/year</th>
<th>Weekday Pump Hours</th>
<th>Weekend Pump Hours</th>
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<tr>
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<td>0</td>
</tr>
<tr>
<td>N/A</td>
<td>Nil</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Macquarie river margin of error to apply to flow trigger: na

### FORECAST WATER DEMAND:

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<tr>
<th>Quarter</th>
<th>1st Quarter</th>
<th>2nd Quarter</th>
<th>3rd Quarter</th>
<th>4th Quarter</th>
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<td></td>
<td>998</td>
<td>1420</td>
<td>1728</td>
<td>1193</td>
</tr>
</tbody>
</table>

### MACQUARIE RIVER:

- Average water transferred from Macquarie River: nil ML
- Is temporary licence volume transfer required? YES
- If yes, transfer volume required: na ML

### APPROVAL:

Prepared by:

Water and Sewerage Strategic Manager:  
Signature:  
Date:

Reviewed and authorised by:

Director Technical Services:  
Signature:  
Date:
Attachment D

Aquatic Environment Monitoring Program
AQUATIC ENVIRONMENT MONITORING PROGRAM

RAW WATER SUPPLY OEMP – ATTACHMENT D

JUNE 2018
<table>
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<th>Revision Date</th>
<th>Details</th>
<th>Authorised</th>
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<td>Draft for review</td>
<td>M Haege/Geolyse</td>
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<td>6.1</td>
<td>26/08/16</td>
<td>Issue for implementation – includes minor edits corrections</td>
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<td>6.2</td>
<td>22/09/16</td>
<td>Minor edits and clarification of sampling protocols. Naming of aquatic ecology sampling sites. Added Commonwealth approval condition.</td>
<td>M Haege/Geolyse</td>
</tr>
<tr>
<td>6.2</td>
<td>13/10/16</td>
<td>Adjusted aquatic habitat monitoring reach length to be consistent with AusRivAs.</td>
<td>M Haege/Geolyse</td>
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<tr>
<td>7.0</td>
<td>15/06/18</td>
<td>Updated to address actions identified in the Internal Compliance Audit</td>
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<td>Abbreviation</td>
<td>Description</td>
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<td></td>
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<td>--------------</td>
<td>-------------</td>
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<tr>
<td>AEMP</td>
<td>Aquatic Environmental Monitoring Program</td>
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<td>Australian height datum</td>
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<td>AMS</td>
<td>Adaptive management strategy</td>
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<td>ANZECC</td>
<td>Australian and New Zealand Environment and Conservation Council</td>
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<td>ARMCA NZ</td>
<td>Agriculture and Resource Management Council of Australia and New Zealand</td>
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<tr>
<td>BSCSHS</td>
<td>Blackmans Swamp Creek stormwater harvesting scheme</td>
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<td>CCS</td>
<td>Community communication strategy</td>
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<td>Cease to flow</td>
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<td>Condition of approval</td>
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<td>Department of Environment and Energy</td>
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</tr>
<tr>
<td>DST</td>
<td>Decision Support Tool</td>
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<td>DoI</td>
<td>Department of Industry</td>
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<td>Kilowatt hour</td>
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<td>mm</td>
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MOP  Macquarie River to Orange pipeline
OCC  Orange City Council
OEMP  Operation Environmental Management Plan
PA  Project approval
PCSHS  Ploughmans Creek stormwater harvesting scheme
ScWMP  Scour water management plan
SEP  Stakeholder engagement plan
STP  Sewage treatment plant
µg/L  Micrograms per litre
µS/cm  Micro Siemens per centimetre
WAL  Water access licence
WFP  Water filtration plant
WSP  Water sharing plan
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Background

1.1 INTRODUCTION

This Aquatic Environment Monitoring Program (AEMP) is aimed at addressing three aquatic monitoring requirements relating to the Orange raw water supply system:

- operation of the Macquarie River to Orange pipeline;
- environmental flow releases from Suma Park Dam; and
- Suma Park Dam Statement of Approval 80CA722752.

1.2 AEMP CONTEXT

Specific requirements are provided below.

**Project Approval for the Macquarie River to Orange pipeline**

Condition B1 of the Project Approval outlines the requirements for the AEMP which shall be developed:

(a) **in consultation with DPI (NSW Office of Water and Fisheries NSW) and OEH**;

(b) **include a monitoring design to**:

   i. **confirm predictions and identify changes in hydrology and aquatic ecology (including fish and aquatic and riparian vegetation); and**

   ii. **determine the efficiency of the offtake design and screens to limit impingement, entrainment and minimise impacts to eggs, larvae or changes to recruitment of threatened aquatic species.**

(c) **include an appropriate number and location of monitoring points to determine impacts and changes to hydrology and aquatic ecology at**:

   i. **Cobbs Hut Hole including the offtake and riffle or rockbar sections from operation of the pipeline**;

   ii. **in Summer Hill Creek resulting from increased flow volumes and spills from Suma Park Dam; and**

   iii. **other locations as necessary.**
Condition 5 of DSEWPC approval (EPBC 2011/6202) requires the preparation and implementation of an AEMP in order to protect the EPBC listed Trout Cod (*Maccullochella macquariensis*), Murray Cod (*Maccullochella peelii peelii*) and Macquarie Perch (*Macquaria australasica*). The scope of the AEMP closely follows that defined in Condition B1 of the Project Approval and is:

The program shall be developed:

(a) in consultation with NSW Office of Water and Fisheries NSW;

(b) include a monitoring design to:

   i. confirm predictions and identify changes in hydrology and aquatic ecology (including fish and aquatic and riparian vegetation);

   ii. determine the efficiency of the offtake design and screens to limit impingement, entrainment and minimise impacts to eggs, larvae or changes to recruitment of threatened aquatic species;

   iii. identify thresholds which when exceeded trigger corrective actions/adaptive management responses.

(c) include an appropriate number and location of monitoring points to determine impacts and changes to hydrology and aquatic ecology:

   i. from operation of the pipeline at Cobbs Hut Hole including the offtake and riffle or rockbar sections;

   ii. from increased flow volumes and spills from Suma Park Dam into Summer Hill Creek; and

   iii. other locations as necessary.

**Environmental Flow Rules**

The report titled *Concept, Detailed Design and Document for Upgrading Suma Park Dam – P503083 Summer Hill Creek environmental flows determination* defines four environmental flow rules for Summer Hill Creek to meet the broad objectives of maintaining/enhancing water quality, biodiversity and river health (Entura, 2013).

The four rules are:

- Rule 1: Maintenance of base flow
- Rule 2: Maintenance of base flow during dry conditions
- Rule 3: Freshes
- Rule 4: Preservation of storage level in Suma Park Dam
The key values identified in the environmental flow study and the flow element required to maintain or enhance the key values are summarised in Table 1.1. Note the environmental flow Rule 4 which suspends all environmental flow releases if the storage in Suma Park Dam falls below 25% is intended to preserve water supplies and therefore is not applicable to the AEMP.

Table 1.1 – Summary of key values, flow requirements and environmental flow rules

<table>
<thead>
<tr>
<th>Key value</th>
<th>Key flow requirement</th>
<th>Met by environmental flow rule</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water quality</td>
<td>Base flow/freshes</td>
<td>Rule 1, 2 and 3</td>
</tr>
<tr>
<td>Biodiversity</td>
<td>Base flow</td>
<td>Rule 1, 2 and 3</td>
</tr>
<tr>
<td>River health and general ecological condition</td>
<td>Base flow/freshes</td>
<td>Rule 1, 2 and 3</td>
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<td>Riparian health and wildlife corridors</td>
<td>Base flow</td>
<td>Rule 1, 2 and 3</td>
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<tr>
<td>Landowner rights/access &amp; downstream supply for domestic and agriculture</td>
<td>Base flow</td>
<td>Rule 1 and 2</td>
</tr>
</tbody>
</table>

Source: (Entura, 2013, p79)

Section 9.5.3 of the report recommends ongoing operational monitoring and evaluation to demonstrate the efficient and effective use [of] the environmental water releases, achievement of the environmental flow objectives and to support adaptive management and improvement (Entura, 2013, p80).

**Suma Park Dam Statement of Approval 80CA722752**

The Statement of Approval issued by the NSW Office of Water for the Suma Park Dam upgrade includes monitoring requirements relating to the low flow environmental flow rule (Rule 2). These are included under Condition 1F of Statement of Approval 80CA722752 as follows:

**Condition 1F**

(a). Once the control structure has been installed a report must be submitted to the NSW Office of Water, Dubbo office within three (3) months of a manual flow gauging recording a flow rate of between 1 ML/day and 5 ML/day at the Third Crossing gauge [no. 421197].

(b). For the flow rate being assessed, the report must include:

(i). The flow rate (ML/day) at the third crossing gauge [no. 421197],

(ii). The percentage of habitat low flow riffle maintained at four (4) riffles on Summer Hill Creek between the confluence of Emu Swamp Creek and the confluence of Blackmans Swamp Creek,

(iii). A review of the accuracy of the third crossing gauge [no. 421197] in measuring the flow trigger of 1.75 ML/day, and

(iv). A review of whether the flow trigger of 1.75 ML/day maintains 4 % habitat low flow riffles on Summer Hill Creek between the confluence of Emu Swamp Creek and the confluence of Blackmans Swamp Creek,
(c) The report must be prepared and submitted to the NSW Office of Water, Dubbo office, every five (5) years from the date of the first report being submitted to ensure changes in the river channel have not altered the ability of the flow trigger to maintain 4% habitat low flow riffles on Summer Hill Creek between the confluence of Emu Swamp Creek and the confluence of Blackmans Swamp Creek.

The flow control structure referred to in the above condition is the v-notch control section at the Third Crossing gauge which was completed in December 2014. Its rating is still being confirmed.

1.3 AEMP OBJECTIVES

The overall objective of the AEMP is to meet the aquatic monitoring requirements for the pipeline and environmental flow rules.

The specific objectives of this AEMP are:

1. To identify any changes in hydrology and aquatic ecology (including fish and aquatic and riparian vegetation) in the Macquarie River as a result of the operation of the Macquarie River to Orange pipeline project.

2. To determine the efficiency of the Macquarie River to Orange pipeline offtake design and screens to limit impingement, entrainment and minimise impacts to eggs, larvae or changes to recruitment of threatened aquatic species.

3. To identify any changes in hydrology and aquatic ecology (including fish and aquatic and riparian vegetation) in Summer Hill Creek as a result of increased flow volumes and spills from Suma Park Dam.

4. To determine if the environmental flow releases maintain or enhance the key values of water quality, aquatic biodiversity, river health and general ecological condition of Summer Hill Creek.

5. To identify if environmental flow Rule 2 maintains 4% riffle habitat at four (4) riffles on Summer Hill Creek between the confluence of Emu Swamp Creek and the confluence of Blackmans Swamp Creek.
Monitoring Program

2.1 MONITORING YEAR

The monitoring year is defined as 1 July to 30 June.

Reporting for the AEMP will be completed by **31 July** each year to allow completion and submission of an Annual Review as required by Condition C5 of the Macquarie River to Orange pipeline Project Approval by **1 September** each year.

2.2 HYDROLOGY

Hydrology data shall be collected and reported in accordance with the **Attachment E: Hydrology Monitoring Program**.

2.3 MACQUARIE RIVER HYDRAULICS

Verification of water level changes in pools and riffles in the Macquarie River as a result of the operation of the Macquarie River to Orange pipeline shall be undertaken in accordance with the scope outlined in **Attachment K: Management Studies**.

2.4 WATER QUALITY

2.4.1 AIMS

The aims of the water quality monitoring program are to inform the aquatic monitoring program, specifically:

- Provide data for the development of site specific water quality triggers as described by the ARMCANZ/ANZECC (2000) national guidelines;
- Provide a water quality database for the identification of trends and comparison with predictions; and
- Assist management of environmental flow releases from Suma Park Dam.

Operational water quality monitoring for the bores, stormwater harvesting and the Macquarie River to Orange pipeline is addressed in **Section 3.2.4** of the **OEMP**.
2.4.2 MONITORING SITES

A network of six (6) monitoring points will be used to define water quality. These are shown on Figure 1 and include:

- One monitoring point at Site 15 – Suma Park Dam Offtake;
- One monitoring point at Site 42 – Macquarie River Pump Station 1 Offtake at Cobbs Hut Hole;
- Two monitoring sites at Site 45 – Bulgas Road Suma Park Dam – a continuous data logging location immediately downstream of Suma Park Dam and a discrete data location downstream of Bulgas Road;
- One monitoring point at Site 46 – Third Crossing;
- One monitoring point at Site 47 – Ophir Reserve.

The reaches mentioned above are as defined in the environmental flow study (Entura, 2013) which are indicated on Figure 1.

2.4.3 MONITORING PARAMETERS

**Site 15 – Suma Park Dam Offtake**

Water column profiling for:

- pH;
- electrical conductivity (µS/cm);
- temperature (°C);
- turbidity (NTU); and
- dissolved oxygen (mg/L and % saturation).

Water column profiling shall be undertaken monthly at the following depths:

- 5 m
- 10 m
- 20 m

**Site 45 – Bulgas Road Suma Park Dam**

Continuous logging during environmental flow release and/or spill of:

- dissolved oxygen (mg/L and % saturation); and
- temperature (°C).

Telemetered continuous site to allow adaptive management decisions which may include which depth to release water from Suma Park Dam using the variable level offtake.
Figure 1: Water quality monitoring points
Site 45 – Bulgas Road Suma Park Dam, Site 46 – Third Crossing Suma Park Dam, Site 47 – Ophir Reserve Suma Park Dam and Site 42 – Macquarie River Pump Station 1 Offtake at Cobbs Hut Hole

Field measurements for:
- pH;
- electrical conductivity (µS/cm);
- temperature (°C);
- turbidity (NTU); and
- dissolved oxygen (mg/L and % saturation).

Grab sampling and laboratory analysis for:
- electrical conductivity (µS/cm);
- total dissolved solids (mg/L);
- total suspended solids (mg/L);
- Dissolved metals (mg/L): including
  - Aluminium
  - Cadmium
  - Chromium
  - Copper
  - Lead
  - Mercury
  - Nickel
  - Zinc
- Nutrients (nitrogen and phosphorous, mg/L);
- Faecal coliforms (cfu/100mL);
- Chlorophyll-a (µg/L);
- Blue-green algae (cell count and biovolume);
- Chemical oxygen demand (COD, mg/L); and
- Alkalinity (mg/L)

Site 42 – Macquarie River Pump Station Offtake 1 at Cobbs Hut Hole (Continuous)

Continuous logging only during operation of Pump Station 1 of:
- pH; and
- turbidity (NTU).

Telemetered site to allow adaptive management decisions. Logging to commence 15 minutes before Pump Station 1 starts and ceases when Pump Station 1 stops. It is noted that there is a 15 minute delay whilst turbidity settles within the set point (15 NTU).
2.4.4 MONITORING FREQUENCY

Water profiling in Suma Park Dam will be undertaken monthly. Discrete sampling will be undertaken at four (4) monitoring points (Site 45 – Bulgas Road Suma Park Dam, Site 46 – Third Crossing Suma Park Dam, Site 47 – Ophir Reserve Suma Park Dam and Site 42 – Macquarie River Pump Station 1 Offtake at Cobbs Hut Hole) monthly for three years. The frequency of sampling will be reviewed after three years.

Continuous logging will occur immediately downstream of Suma Park Dam during environmental flow release and/or spill. Continuous logging at Pump Station 1 at Cobbs Hut Hole during operation of Pump Station 1.

2.4.5 REPORTING

Water quality results shall be reported in the AEMP annual report (refer to Section 2.8).

2.5 AQUATIC ECOLOGY

2.5.1 MONITORING SITES

Aquatic monitoring sites will be undertaken at 13 sites as shown on Figure 2 and include:

- Four (4) sites in Summer Hill Creek downstream of Suma Park Dam (SH1, SH2, SH3 and SH4);
- Four (4) sites upstream of the pump offtake in the Macquarie River (M1, M2, M3 and M4);
- Four (4) sites downstream of the pump offtake in the Macquarie River (M6, M7, M8 and M9); and
- One (1) site at the pump offtake in Cobbs Hut Hole in the Macquarie River (CH1).

2.5.2 MONITORING PARAMETERS

Aquatic Habitat Mapping

Aquatic and riparian features will be mapped for 100 m reaches (or 10 times the modal width, whichever is the largest) at each of the 13 sites.

The following aquatic habitat data will be obtained for each monitoring site:

- Qualitative habitat data in accordance with standard AusRivAS protocol;
- Modified riparian, channel and environmental inventory (RCE score);
- Fish habitat classification; and
- An inventory of aquatic flora.

In Summer Hill Creek, specific platypus habitat assessment will be conducted including bank substrate and targeted searches for breeding places.
Aquatic (biological) sampling

Aquatic (biological) monitoring will include:

- Macroinvertebrate sampling in accordance with standard AusRivAS protocol; and
- Fish assemblage sampling in accordance with the Murray-Darling Basin Authority’s Sustainable Rivers Audit (SRA) sampling protocol.

Efficiency of Pump Offtake Design – Fish Entrainment

A laboratory scale study has been undertaken by DPI Fisheries to determine the efficiency of the pump offtake design in limiting the entrainment of fish.
Figure 2: Aquatic monitoring sites
2.5.3 MONITORING FREQUENCY

Aquatic habitat and aquatic (biological) sampling will occur at the same time on the following frequency:

- Summer Hill Creek monitoring sites – monitoring will occur two (2) times each year in autumn (March to June) and spring (September to December) consistent with AusRivAS protocol (see exception for fish assemblage sampling).
- Macquarie River monitoring sites – monitoring will occur one (1) time each year in autumn (March to June).

Fish assemblage sampling will only occur one (1) time per year at each site in autumn.

Aquatic habitat and aquatic (biological) sampling frequency will be reviewed after three years.

2.5.4 REPORTING

Aquatic ecology monitoring results shall be reported in the AEMP annual report (refer to Section 2.8).

2.6 LOW FLOW RIFFLE MONITORING

2.6.1 AIMS

Riffle monitoring will be undertaken in Reach 2 (a section of Summer Hill Creek upstream of the Third Crossing gauge) to meet Condition 1F of Statement of Approval 80CA722752.

2.6.2 MONITORING SITES

Riffle monitoring will be undertaken at four (4) representative riffle zones in Reach 2 (as defined by Entura, 2013) which is identified as being 430 m to 2,150 m upstream of the Third Crossing.

This monitoring zone is in Summer Hill Creek between the confluence of Emu Swamp Creek and the confluence of Blackmans Swamp Creek.

2.6.3 MONITORING PARAMETERS AND APPROACH

The following parameters will be recorded for the monitoring reach:

- The flow at the time of undertaken field measurements. This can be done by noting the time of the field measurements and interrogating the NOW database to identify the creek level and flow (at gauging station 421197);
- The habitat area at bank full wetted perimeter – this will be recorded through a combination of GPS measurement and digital aerial photography;
- A digital aerial photograph of each riffle zone; and
• The area of all riffle zones in the monitoring reach – this will be done through a combination of aerial digital photography and site measurement using GPS and survey equipment as practicable.

The following parameters will be recorded for the four (4) representative riffle zones:

• The flow at the time of undertaken field measurements. This can be done by noting the time of the field measurements and interrogating the NOW database to identify the creek level and flow (at gauging station 421197);
• A digital aerial photograph of each representative riffle zone; and
• The area of each representative riffle zone – this will be done through a combination of aerial digital photography and site measurement using GPS and survey equipment as practicable.

The measurements of the representative riffle zones will be undertaken on two occasions at flows of about:

• 1.75 ML/day; and
• 15 ML/day (the flow identified as providing the optimum riffle habitat (Entura, 2013)).

2.6.4 MONITORING FREQUENCY

The riffle zone monitoring will be undertaken in the first quarter of the 2016/17 water year (if flow conditions permit) and then every five (5) years as required by Condition 1F(c) of Statement of Approval 80CA722752.

The monitoring of riffle zones will be reviewed in consultation with the NSW Department of Industry – Water (DoI – Water) if required.

2.6.5 REPORTING

A separate report will be prepared following the riffle zone monitoring and submitted to the DoI Water as required by Condition 1F(a) of Statement of Approval 80CA722752.

The report will include (at a minimum) the detail listed in Condition 1F(b) of Statement of Approval 80CA722752 (refer to Section 1.2).

The riffle monitoring report will be appended to the Annual Review (refer to OEMP Section 4.4) as required.
### 2.7 Monitoring Summary

A summary of the AEMP monitoring is provided in Table 2.1.

**Table 2.1 – Summary of AEMP monitoring**

<table>
<thead>
<tr>
<th>Component</th>
<th>Locations</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water quality</td>
<td>6</td>
<td>Monthly for three years then review</td>
</tr>
<tr>
<td>Aquatic ecology</td>
<td>13</td>
<td>Two times per year (autumn and spring) in Summer Hill Creek One time per year (autumn) in Macquarie River Review after three (3) years</td>
</tr>
<tr>
<td>Riffle zones</td>
<td>4</td>
<td>First quarter 2016/17 water year (if flow conditions permit) then every five (5) years</td>
</tr>
</tbody>
</table>

### 2.8 Reporting

#### 2.8.1 Report Preparation

Reporting for the AEMP will be completed in time to allow completion and submission of an Annual Review as required by CoA CS of the Macquarie River to Orange pipeline Project Approval by 1 September each year.

The AEMP annual report will:

- Provide an overview of monitoring activities for the reporting year;
- Include a summary of monitoring results including a comparison with all historical results and interpretation for the current year;
- Identify any trends in the monitoring data;
- Identify any non-compliance with the AEMP and what actions were (or are being) taken to ensure compliance;
- Identify any discrepancies between the predicted and actual impacts of the Macquarie River to Orange pipeline operation and analyse the potential cause of any significant discrepancies;
- Provide specific comment against the objectives listed in Section 1.3 of this AEMP;
- Identify if any monitoring parameters and/or frequency should be changed; and
- Identify measures that could be implemented to improve the environmental performance of the Macquarie River to Orange pipeline operation or environmental flow releases. Justify any decision to not implement those measures.

The AEMP annual report will not include results of the low flow riffle monitoring (refer to Section 2.6). This shall be reported separately.
2.8.2 REPORT DISSEMINATION

The AEMP report will be attached to the Annual Review.

The Annual Review will be disseminated to the agencies below in accordance with Section 4.4 – OEMP Reporting:
- DoI Water and DPI Fisheries;
- Office of Environment and Heritage (OEH);
- Department of the Environment and Energy (formerly DSEWPC); and
- Department of Planning and Environment.

2.9 ADAPTIVE MANAGEMENT

Results from the implementation of the AEMP will be used to inform the Adaptive Management Strategy in accordance with Attachment I: Adaptive Management Strategy.

2.10 AEMP REVIEW

2.10.1 REVISION TO STRATEGIES, PLANS AND PROGRAMS

CoA C6 requires that OCC shall review, and if necessary revise, strategies, plans and programs included in the OEMP to the satisfaction of the Director-General within 3 months of:

a) the Annual Review (Section 4.4 – OEMP Reporting);
b) any Incident Report (Section 3.2.18 – Environmental Incident Management);
c) an Audit Report (Section 5.3 – Environmental Auditing and Compliance); or
d) any modification to the conditions of the Project Approval,

This is to ensure that plans and programs are updated on a regular basis, and incorporate any recommended measures to improve environmental performance.

2.10.2 DOCUMENT CONTROL

The following will be classed as ‘major’ revisions:
- Changes to processes;
- Changes to monitoring programs, either timing or parameters monitored;
- Changes made in response to an incident; and/or
- Changes requested by a relevant Government agency.

Major revisions will be identified by the whole number in the version number (i.e. 1.0, 2.0, 3.0....) and will be reviewed, approved and re-circulated as necessary.
The following will be classed as ‘minor’ revisions:

- Minor typing and grammar corrections;
- Changes to position titles; and
- Updates to recording forms to suit changes in operations.

Minor revisions will be identified by the decimal point in the version number (i.e. 1.1, 2.2, 3.3....) and will not require review and approval prior to re-circulation.

Major and minor revisions will be listed in the Revision History at the front of this document.
References


Attachment E

HYDROLOGY MONITORING PROGRAM
## Revision History

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# ABBREVIATIONS

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<td>AEMP</td>
<td>Aquatic Environmental Monitoring Program</td>
</tr>
<tr>
<td>AHD</td>
<td>Australian height datum</td>
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<tr>
<td>AMS</td>
<td>Adaptive management strategy</td>
</tr>
<tr>
<td>ANZECC</td>
<td>Australian and New Zealand Environment and Conservation Council</td>
</tr>
<tr>
<td>ARMCA NZ</td>
<td>Agriculture and Resource Management Council of Australia and New Zealand</td>
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<td>Blackmans Swamp Creek stormwater harvesting scheme</td>
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<td>CCS</td>
<td>Community communication strategy</td>
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<td>Cease to flow</td>
</tr>
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<td>CoA</td>
<td>Condition of approval</td>
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<tr>
<td>DST</td>
<td>Decision Support Tool</td>
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<td>DoI</td>
<td>Department of Industry</td>
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<td>Department of Primary Industries</td>
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<tr>
<td>EA</td>
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</tr>
<tr>
<td>EP&amp;A Act</td>
<td>NSW Environmental Planning and Assessment Act 1979</td>
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<tr>
<td>GL</td>
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<td>GMP</td>
<td>Groundwater monitoring program</td>
</tr>
<tr>
<td>ha</td>
<td>Hectares</td>
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<tr>
<td>HMP</td>
<td>Hydrology monitoring program</td>
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<tr>
<td>IMP</td>
<td>Inspection and maintenance plan</td>
</tr>
<tr>
<td>kL</td>
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<td>km</td>
<td>Kilometre (1,000 metres)</td>
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<td>mm</td>
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<td>Macquarie River to Orange pipeline</td>
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<td>Scour water management plan</td>
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<td>Sewage treatment plant</td>
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<tr>
<td>µg/L</td>
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<td>µS/cm</td>
<td>Micro Siemens per centimetre</td>
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<td>WAL</td>
<td>Water access licence</td>
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<td>WFP</td>
<td>Water filtration plant</td>
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<td>WSP</td>
<td>Water sharing plan</td>
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<td>Figure 4</td>
<td>Water balance – example 2</td>
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<td>Figure 8</td>
<td>Water balance – example 6</td>
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1.1 INTRODUCTION

This Hydrology Monitoring Program (HMP) forms part of the Orange Raw Water Supply Operational Environmental Monitoring Plan (OEMP).

It has been developed to manage hydrological limits, monitoring data and hydrological reporting for the raw water supply system.

1.2 HYDROLOGY MONITORING PROGRAM

Specific requirements for the HMP are provided below.

**Project Approval for the Macquarie River to Orange pipeline**

Condition B6 of the Project Approval outlines the following requirement:

*B6 River flow gaugings shall be completed for Gauging Station 421192 in order to improve and verify the streamflow rating for the Macquarie River at Gauging Station 421192, in consultation with DPI (NOW).

The operating rules shall adopt a flow trigger that includes a margin of error of the flow rating determined in consultation with DPI (NOW) until such time as DPI (NOW) is satisfied that the flow rating correlates with flows in the Macquarie River at Gauging Station 421192.*

**Water Access Licences**

OCC holds four Water Access Licences (WALs) which have conditions relating to maximum extraction, monitoring and record keeping. These conditions are included as required in the HMP.

**Statement of Commitments**

Fully implementing daily extraction management in accordance with the guidelines ‘Advice to Water Management Committee No. 6’ (NSW Government, 2002) and would undertake the following:

- daily reading and logging of the upstream river gauge
- logging of all flow meters and pump run time
- annual reporting of project operations
1.2.1 HMP OBJECTIVES

The objectives of the HMP are to:

- Ensure extraction limits defined by the WAL’s are not exceeded;
- Define a method for extraction accounting;
- Ensure relevant data is recorded and captured to inform the hydrology component of the AEMP; and
- Define monthly and annual reporting requirements.
2.1 WATER ACCESS LICENCES

OCC holds the Water Access Licences (WALs) listed in **Table 2.1**.

Table 2.1 – Water Access Licence (WAL) summary

<table>
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<th>Type</th>
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<td>Surface Water</td>
<td>80CA722752, 80WA723739</td>
<td>7,800 ML</td>
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<td>Suma Park Dam</td>
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<td></td>
<td>Blackmans Swamp Creek SHS</td>
<td>80WA723740</td>
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<td>33891</td>
<td>Surface Water</td>
<td>80CA718056</td>
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<td></td>
<td>Ploughmans Creek Stormwater Harvesting</td>
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<tr>
<td>30283</td>
<td>Groundwater</td>
<td>80CA715992</td>
<td>182 ML</td>
</tr>
<tr>
<td></td>
<td>Clifton Grove Bores</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Shearing Shed and Bore No 5)</td>
<td></td>
<td></td>
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<td>29148</td>
<td>Groundwater</td>
<td>80CA715359</td>
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<td>Showground/Margaret Street Depot Bores</td>
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<tr>
<td>36374</td>
<td>Surface Water</td>
<td>-</td>
<td>643 ML</td>
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<td></td>
<td>Macquarie River</td>
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2.2 LICENSED EXTRACTION LIMITS

2.2.1 SURFACE WATER

2.2.1.1 WAL 36161 – Suma Park Dam, Spring Creek Dam, Blackmans Swamp Creek SHS

Share component is 7,800 ML.

**Water Take – condition MW0004-00001**

From 1 July 2013, the total volume of water taken in any three (3) consecutive water years under this access licence must not exceed a volume which is equal to the lesser of either:

A. the sum of:

   i. water in the account from the available water determinations in those 3 consecutive water years, plus
   
   ii. water in the account carried over from the water year prior to those 3 consecutive water years, plus
   
   iii. any net amount of water assigned to or from this account under a water allocation assignment in those 3 consecutive water years, plus
   
   iv. any water re-credited by the Minister to the account in those 3 consecutive water years,
or

B. the sum of:

i. the share component of this licence at the beginning of the first year in those 3 consecutive water years, plus

ii. the share component of this licence at the beginning of the second year in those 3 consecutive water years, plus

iii. the share component of this licence at the beginning of the third year in those 3 consecutive water years, plus

iv. any net amount of water assigned to or from this account under a water allocation assignment in those 3 consecutive water years, plus

v. any water re-credited by the Minister to the account in those 3 consecutive water years.

**Carryover – condition MW0112-00001**

The maximum water allocation that may be carried over in the account for this access licence from one water year to the next water year is:

A. a volume equal to 100% of the share component of the licence, or

B. 1 ML/unit share of the share component of the licence.

**2.2.1.2 WAL 33891 – Ploughmans Creek SHS**

Share component is 700 ML.

**Water Take – condition MW0004-00001**

From 1 July 2013, the total volume of water taken in any three (3) consecutive water years under this access licence must not exceed a volume which is equal to the lesser of either:

A. the sum of:

i. water in the account from the available water determinations in those 3 consecutive water years, plus

ii. water in the account carried over from the water year prior to those 3 consecutive water years, plus

iii. any net amount of water assigned to or from this account under a water allocation assignment in those 3 consecutive water years, plus

iv. any water re-credited by the Minister to the account in those 3 consecutive water years,

or

B. the sum of:

i. the share component of this licence at the beginning of the first year in those 3 consecutive water years, plus
ii. the share component of this licence at the beginning of the second year in those 3 consecutive water years, plus

iii. the share component of this licence at the beginning of the third year in those 3 consecutive water years, plus

iv. any net amount of water assigned to or from this account under a water allocation assignment in those 3 consecutive water years, plus

v. any water re-credited by the Minister to the account in those 3 consecutive water years.

**Carryover – condition MW0112-00001**

The maximum water allocation that may be carried over in the account for this access licence from one water year to the next water year is:

A. a volume equal to 100% of the share component of the licence, or

B. 1 ML/unit share of the share component of the licence.

### 2.2.2 GROUNDWATER

#### 2.2.2.1 WAL 30283 – Clifton Grove Bores (Shearing Shed and Bore No 5)

Share component is 182 ML.

The maximum volume of water that may be taken under this WAL in any water year must not exceed a volume equal to:

(A) the sum of water allocations accrued to the water allocation account for this licence from available water determinations in that year; plus

(B) the water allocations carried over from the water year prior to that water year; plus

(C) the net amount of any water allocations assigned to or from the water allocation account for this licence under section 71T of the Water Management Act 2000; plus

(D) any water allocations re-credited to the water allocation account for this licence in accordance with section 76 of the Water Management Act 2000 in that water year.

The maximum water allocation that may be carried over in the water allocation account for this WAL from one water year to the next is 10% of the WAL share component.

#### 2.2.2.2 WAL 29148 – Showground and Margaret Street Depot Bores

Share component is 280 ML.
The maximum volume of water that may be taken under this WAL in any water year must not exceed a volume equal to:

(A) the sum of water allocations accrued to the water allocation account for this licence from available water determinations in that year; plus

(B) the net amount of any water allocations assigned to or from the water allocation account for this access licence under section 71T of the Water Management Act 2000; plus

(C) any water allocations re-credited to the water allocation account for this licence in accordance with section 76 of the Water Management Act 2000.

Water allocations remaining in the water allocation account for WAL29148 cannot be carried over from one water year to the next.

2.2.2.3 WAL 36374 – Macquarie River

Share component is 643 ML.

**Water Take – condition MW0004-00001**

*From 1 July 2013, the total volume of water taken in any three (3) consecutive water years under this access licence must not exceed a volume which is equal to the lesser of either:*

A. the sum of:

   i. water in the account from the available water determinations in those 3 consecutive water years, plus

   ii. water in the account carried over from the water year prior to those 3 consecutive water years, plus

   iii. any net amount of water assigned to or from this account under a water allocation assignment in those 3 consecutive water years, plus

   iv. any water re-credited by the Minister to the account in those 3 consecutive water years,

or

B. the sum of:

   i. the share component of this licence at the beginning of the first year in those 3 consecutive water years, plus

   ii. the share component of this licence at the beginning of the second year in those 3 consecutive water years, plus

   iii. the share component of this licence at the beginning of the third year in those 3 consecutive water years, plus

   iv. any net amount of water assigned to or from this account under a water allocation assignment in those 3 consecutive water years, plus

   v. any water re-credited by the Minister to the account in those 3 consecutive water years.
**Carryover – condition MW0112-00001**

The maximum water allocation that may be carried over in the account for this access licence from one water year to the next water year is:

A. a volume equal to 100% of the share component of the licence, or

B. 1 ML/unit share of the share component of the licence.

### 2.2.3 WATER ACCOUNTING

OCC currently holds a licence authorising surface water extraction of 8,500 ML/annum from the Macquarie River catchment for town water supply purposes (WAL 36161: 7,800 ML; WAL 33891: 700 ML). Consultation with the NSW Department of Industry – Water (DoI Water) for various harvesting schemes has confirmed that Council is entitled to develop alternative points of extraction under the current licences, provided these are located within the unregulated section of the Macquarie system, and provided that the total extraction does not exceed the licensed amount of 8,500 ML in any year.[1]

Suma Park Dam is the receipt point for harvested water from stormwater, bores and the Macquarie River. It is also the withdrawal point for the town water supply.

From a water accounting perspective, the volume of water extracted from Suma Park Dam to meet town water demand represents the volume that should be reported as the amount extracted for town water supply purposes. As such, records of the volume transferred from Suma Park Dam to the Icely Road water filtration plant provide the records for annual water accounting against licence limits.

A rationale and calculations supporting this position is provided in Appendix A.

An important outcome from this approach is that the volume of spill from Suma Park Dam needs to be recorded. This can be determined from inflow records on spill days.

### 2.3 ENVIRONMENTAL FLOW RULES

Approval 80CA722752 issued under the Water Management Act 2000 defines the environmental flow rules for Suma Park Dam.

---

[1] Any harvested stormwater would form part of this 8,500 ML entitlement. After transferral to Suma Park, the subsequent extraction of this water (for delivery to the Icely Road WFP) would not be “double counted” or deducted a second time from the cap entitlement.
The following environmental flow releases apply:

**DK0989-00001**

A. When the flow in Summer Hill Creek at the Icely Road gauge [no. 421185] is:

   i. 1 ML/day or less, the flow of water released into the Summer Hill Creek downstream of Suma Park Dam must be equivalent to the flow in Summer Hill Creek at the Icely Road gauge [no. 421185]; or

   ii. above 1 ML/day, the flow of water released into the Summer Hill Creek downstream of Suma Park Dam must be 1 ML/day.

B. When the flow at Summer Hill Creek at the third crossing gauge [no. 421197] is less than 1.75 ML/day, the flow in Summer Hill Creek must be supplemented to maintain a flow of 1.75 ML/day at the third crossing gauge. This flow must be monitored on a three (3) day rolling average, using the telemetry data being recorded at the third crossing gauge.

C. If the flow in Summer Hill Creek at the Icely Road gauge [no. 421185] exceeds:

   i. 7 ML/day in summer (December, January, February), or

   ii. 4.3 ML/day in autumn (March, April, May),

   a release from Suma Park Dam must be immediately increased:

   iii. in summer to 7 ML/day for a maximum of eighteen (18) days or until such time as the flow at the Icely Road gauge falls below 7 ML/day, or

   iv. in autumn to 4.3 ML/day for a maximum of seventeen (17) days or until such time as the flow at the Icely Road gauge falls below 4.3 ML/day.

Such a release is only required once in summer and once in autumn every year. If a spill event occurs that is equivalent to or greater than the required release, then this can be considered equivalent to the required release for that summer or autumn period.

D. These releases are suspended when the combined storage volume of Suma Park Dam, Gosling Creek Reservoir and Spring Creek Reservoir measures less than 25 %. The releases must recommence when the combined storage volume of Suma Park Dam, Gosling Creek Reservoir and Spring Creek Reservoir exceeds 30 %.
Hydrology Monitoring Program

3.1 OPERATING YEAR

The operating year is defined as 1 July to 30 June.

This is to be consistent with the water year as used by the DoI Water for reporting under the Water Management Act 2000.

3.2 MONITORING SITES

3.2.1 MONITORING NETWORK

A network of stream gauging stations and flow meters will be used to define hydrology. The majority are shown on Figure 1 and include:

- Macquarie River at Yarracoona (station 421191);
- Macquarie River downstream of Long Point (pump offtake point) (station 421192);
- Summer Hill Creek at Icely Road (station 421185);
- Summer Hill Creek at the Third Crossing bridge (station 421197);
- Environmental flow release pipe (flow meter);
- Sewage Treatment Plant (STP) gauge;
- STP discharge calculation;
- Macquarie River to Orange pipeline Pump Station 1 (MOP PS1) flow meter;
- Blackmans Swamp Creek stormwater harvesting scheme Pump Station 1 (BSCSHS PS1) flow meter;
- Stormwater harvesting scheme flow meters at pump stations 2, 3 and 7;
- Flow meters on the Ploughmans Creek stormwater harvesting scheme at pump stations PCSHS 4, PCSHS 5 and PCSHS 6;
- Levels in the v-notch weirs located at Ploughmans Creek stormwater harvesting scheme pump stations 4 and 6 (PCSHS 4 and PCSHS 6). These control the pump operation and record low flows only;
- Ploughmans Creek gauging station at North Orange 1 SPS;
- Flow meters on the Showground Bore and Clifton Grove Bores (Shearing Shed Bore and Bore No 5); and
- Suma Park Dam raw water pump station (flow meter).

The following storage data will be recorded:

- Weekly level/volume in Suma Park Dam, Spring Creek Dam and Gosling Creek Reservoir; and
- Weekly level/volume in the stormwater holding pond.
Figure 1: Stream gauges and flow meters
3.2.2 HYDROMETRIC SERVICE AGREEMENT

There are six main stream gauging stations in the system:

- Macquarie River downstream of Long Point (pump offtake point) (station 421192);
- Summer Hill Creek at Icely Road (station 421185);
- Summer Hill Creek at the Third Crossing bridge (station 421197);
- Blackmans Swamp Creek at the Sewage Treatment Plant (STP) gauge (station 421051);
- Ploughmans Creek gauging station at North Orange 1 Sewage Pump Station (station 421186); and
- Suma Park Dam environmental flow release pipe (station 421196).

Records of flow from the environmental flow release valve and pipe at Suma Park Dam are also deemed important.

These sites will be maintained through a service agreement with DoI Water as follows.

When: Completed in June each year.

Actions: 1 The Water Treatment Manager shall request a service agreement from DoI Water for the provision of hydrometric services for the next water year (1 July to 30 June).

The service agreement shall include:

- Operation, maintenance and data management for six (6) stream gauging stations. Data recorded will be level and flow;
- A minimum of 6 routine maintenance visits to the stream gauging stations;
- Maintenance and data management for the environmental flow release from Suma Park Dam. Flow data telemetered only; and
- A minimum of 2 routine maintenance visits to the Suma Park Dam environmental flow release telemetry site.

2 The service agreement will be reviewed and executed (subject to it being suitable) prior to 30 June each year.

Who: The Water Treatment Manager shall be responsible for undertaking Actions 1 to 2.

Records: Executed service agreement.
3.2.3 CHANGES TO RATING CURVES

When: When a new rating curve is issued by DoI Water

Where:  
- 421192 – Macquarie River downstream of Long Point (pump offtake point)
- 421051 – Blackmans Swamp Creek at the STP gauge
- 421185 – Summer Hill Creek at Icely Road
- 421186 – Ploughmans Creek gauging station at North Orange 1 Sewage Pump Station
- 421196 – Suma Park Dam environmental flow release pipe
- 421197 – Summer Hill Creek at Third Crossing bridge

Actions:  
1. The Water Treatment Manager shall check that the Water Treatment Supervisor has received the new rating curve.
2. The Water Treatment Supervisor shall arrange for the operational data to be updated so that:
   - Pump cut-in and cut-out levels can be adjusted as required; and
   - Conversions from level to flow can be updated in data management systems.
3. The Water Treatment Supervisor shall confirm that the updated rating curve has been applied by emailing the Water Treatment Manager.

Who: The Water Treatment Manager shall be responsible for undertaking Action 1.

The Water Treatment Supervisor shall be responsible for undertaking Actions 2 and 3.

Records:  
- Electronic records (email).

3.2.4 GAUGING STATION 421192

Project Approval Condition B6 requires:

B6 River flow gaugings shall be completed for Gauging Station 421192 in order to improve and verify the streamflow rating for the Macquarie River at Gauging Station 421192, in consultation with DPI (NOW).

The operating rules shall adopt a flow trigger that includes a margin of error of the flow rating determined in consultation with DPI (NOW) until such time as DPI (NOW) is satisfied that the flow rating correlates with flows in the Macquarie River at Gauging Station 421192.
The 2015 service agreement with Dol Water indicates a rating accuracy of 10% for gauging station 421192.

Discussion with Dol Water indicates that even with continued river flow gaugings, the accuracy of the rating may not be any better than 10% due to errors in the level measurement and flow measurement undertaken during a stream gauging, and changes to the river geometry.

The rating accuracy will however, continue to be verified with Dol Water during completion of Element 1: Water Year Analysis in the DST (refer to Action 8 in Section 3.3 of the DST).

### 3.2.5 DATA COLLECTION AND MANAGEMENT

Data for the six hydrometric sites under the service agreement with Dol Water will be managed in accordance with that agreement. All other data will be collected and managed by OCC.

OCC shall ensure that data is available for at least 95% of the reporting year. This will be reported in the Annual Review.

A summary of the data capture and reporting units is provided in Table 3.1.

While most data will be captured and logged in times steps as low as 5 minutes, it will be aggregated to units of ML/day for streamflow and pumping volumes, and hours per day for pump run times.

Storage data will be reported as the storage level and volume at midnight on a weekly basis.

<table>
<thead>
<tr>
<th>Site Description</th>
<th>Data Recorded</th>
<th>Data Logging Time</th>
<th>Data Reporting Units</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gauging station 421191 Yarracoona</td>
<td>Level, m Flow, ML/day</td>
<td>15 mins</td>
<td>ML/day</td>
<td>DPI Water site Data obtained from  <a href="http://waterinfo.nsw.gov.au">waterinfo.nsw.gov.au</a></td>
</tr>
<tr>
<td>Gauging station 421192 Macquarie River at Downstream Long Point</td>
<td>Level, m Flow, ML/day</td>
<td>15 mins</td>
<td>ML/day</td>
<td>DPI Water site Data obtained from  <a href="http://waterinfo.nsw.gov.au">waterinfo.nsw.gov.au</a></td>
</tr>
<tr>
<td>Gauging station 421185 Summer Hill Creek at Icely Road</td>
<td>Level, m Flow, ML/day</td>
<td>15 mins</td>
<td>ML/day</td>
<td>DPI Water site Data obtained from  <a href="http://waterinfo.nsw.gov.au">waterinfo.nsw.gov.au</a></td>
</tr>
<tr>
<td>Gauging station 421197 Summer Hill Creek at Third Crossing bridge</td>
<td>Level, m Flow, ML/day</td>
<td>15 mins</td>
<td>ML/day</td>
<td>DPI Water site Data obtained from  <a href="http://waterinfo.nsw.gov.au">waterinfo.nsw.gov.au</a></td>
</tr>
<tr>
<td>Gauging station 421051 Blackmans Swamp Creek at STP gauge</td>
<td>Level, m Flow, ML/day</td>
<td>15 mins</td>
<td>ML/day</td>
<td>DPI Water site Data obtained from  <a href="http://waterinfo.nsw.gov.au">waterinfo.nsw.gov.au</a></td>
</tr>
<tr>
<td>Gauging station 421186 Ploughmans Creek at North Orange 1 Sewage Pump Station</td>
<td>Level, m Flow, ML/day</td>
<td>15 mins</td>
<td>ML/day</td>
<td>DPI Water site Data obtained from  <a href="http://waterinfo.nsw.gov.au">waterinfo.nsw.gov.au</a></td>
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</tbody>
</table>
Table 3.1 – Data capture and reporting summary

<table>
<thead>
<tr>
<th>Site</th>
<th>Data Recorded</th>
<th>Data Logging Time</th>
<th>Data Reporting Units</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gauging Station 421196 Suma Park Dam</td>
<td>Flow, ML/day</td>
<td>15 mins</td>
<td>ML/day</td>
<td>Data obtained from waterinfo.nsw.gov.au</td>
</tr>
<tr>
<td>Suma Park Dam environmental flow release pipe</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MOP PS 1</td>
<td>Flow, L/s Run time, hr</td>
<td>15 mins</td>
<td>ML/day hrs/day</td>
<td>Data logged by OCC</td>
</tr>
<tr>
<td>BSCSHS PS 1</td>
<td>Flow, L/s Run time, hr</td>
<td>15 mins</td>
<td>ML/day hrs/day</td>
<td>Data logged by OCC</td>
</tr>
<tr>
<td>BSCSHS PS 2</td>
<td>Flow, L/s Run time, hr</td>
<td>15 mins</td>
<td>ML/day hrs/day</td>
<td>Data logged by OCC</td>
</tr>
<tr>
<td>BSCSHS PS 3</td>
<td>Flow, L/s Run time, hr</td>
<td>15 mins</td>
<td>ML/day hrs/day</td>
<td>Data logged by OCC</td>
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<tr>
<td>PCSHS PS4</td>
<td>Flow, L/s Run time, hr</td>
<td>15 mins</td>
<td>ML/day hrs/day</td>
<td>Data logged by OCC</td>
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<tr>
<td>PCSHS PS5</td>
<td>Flow, L/s Run time, hr</td>
<td>15 mins</td>
<td>ML/day hrs/day</td>
<td>Data logged by OCC</td>
</tr>
<tr>
<td>PCSHS PS6</td>
<td>Flow, L/s Run time, hr</td>
<td>15 mins</td>
<td>ML/day hrs/day</td>
<td>Data logged by OCC</td>
</tr>
<tr>
<td>Ploughmans PS7</td>
<td>Flow, L/s Run time, hr</td>
<td>15 mins</td>
<td>ML/day hrs/day</td>
<td>Data logged by OCC</td>
</tr>
<tr>
<td>Showground /Margaret Street Depot Bores</td>
<td>Flow, L/s Run time, hr</td>
<td>15 mins</td>
<td>ML/day hrs/day</td>
<td>Data logged by OCC</td>
</tr>
<tr>
<td>Clifton Grove Bores (Shearing Shed Bore &amp; Bore No. 5)</td>
<td>Flow, L/s Run time, hr</td>
<td>15 mins</td>
<td>ML/day hrs/day</td>
<td>Data logged by OCC</td>
</tr>
<tr>
<td>Suma Park Dam raw water pump station</td>
<td>Flow, L/s Run time, hr</td>
<td>15 mins</td>
<td>ML/day hrs/day</td>
<td>Data logged by OCC</td>
</tr>
<tr>
<td>Suma Park Dam</td>
<td>Level, mAHD Vol, ML</td>
<td>15 mins</td>
<td>ML</td>
<td>Data logged by OCC</td>
</tr>
<tr>
<td>Stormwater harvesting holding pond</td>
<td>Level, mAHD Vol, ML</td>
<td>15 mins</td>
<td>ML</td>
<td>Data logged by OCC</td>
</tr>
<tr>
<td>Spring Creek Dam</td>
<td>Level, mAHD Vol, ML</td>
<td>15 mins</td>
<td>ML</td>
<td>Data logged by OCC</td>
</tr>
<tr>
<td>Gosling Creek Reservoir</td>
<td>Level, mAHD Vol, ML</td>
<td>15 mins</td>
<td>ML</td>
<td>Data logged by OCC</td>
</tr>
</tbody>
</table>

3.2.6 DAILY FLOW MANAGEMENT

Orange City Council will implement daily extraction management as recommended by the guidelines ‘Advice to Water Management Committee No. 6’ (NSW Government, 2002).
Management Option 3b, with the exception of daily flow class announcements, will be implemented for the project. Management Option 3b represents the highest level of daily extraction management.

The committed management actions to comply with this level of daily extraction management are:

- daily reading and logging of the upstream river gauge (Station 421192) – this will be achieved with the data capture and management under the service agreement with DoI Water.
- logging of all flow meters and pump run time – all flow meters and pump run times will be captured in Council’s data management system.
- annual reporting for the project operation – a summary of flow data and extraction will be provided monthly. All flow data will be reported annually.

3.2.7 DATA AVAILABILITY

DPI Water Sites

Data from the six stream gauge sites managed by DoI Water will be available 95% of the time at:
- [http://waterinfo.nsw.gov.au](http://waterinfo.nsw.gov.au); or

The five main stream gauge sites are:
- 421192 – Macquarie River downstream of Long Point (pump offtake point)
- 421051 – Blackmans Swamp Creek at the STP gauge
- 421185 – Summer Hill Creek at Icely Road
- 421196 – Suma Park Dam Environmental Flow release
- 421186 – Ploughmans Creek gauging station at North Orange 1 Sewage Pump Station
- 421197 – Summer Hill Creek at Third Crossing bridge

OCC Data

Data captured and managed by OCC will be collected into monthly summary reports (see Section 3.3.1) and published on Council’s website at:

3.3 WAL RECORDS

The WALs require records of the following information:

**Surface Water**

*Condition MW2337-00001*

- A. date, volume of water, start and end time when water was taken as well as the pump capacity per unit of time, and
- B. the access licence number under which the water is taken, and
- C. the approval number under which the water is taken, and
- D. the volume of water taken for domestic consumption and/or stock watering

This data will be captured by the flow meter at each extraction point which are logged with data stored in OCC’s data management system.

**Bores**

*Condition MW0633-00001*

The licence holder must record the following in the logbook:

(i) each date and period of time during which water is taken under this licence;
(ii) the volume of water taken on that date;
(iii) the water supply work approval number of the water supply work used to take the water on that date; and
(iv) the purpose or purposes for which the water was taken on that date.
3.4 ENVIRONMENTAL FLOW RELEASES

When: Continuous

Actions:

1. The Water Treatment Manager shall ensure all operational staff are aware of environmental flow release conditions.

2. The Water Treatment Supervisor shall ensure that the communication system between the Summer Hill Creek at Icely Road gauging station (421185) and the Suma Park Dam environmental flow release pipe (421196) are functioning. This is to ensure environmental flow rule A (below) is achieved.

   A. When the flow in Summer Hill Creek at the Icely Road gauge (421185) is:
      i. 1 ML/day or less, the flow of water released into the Summer Hill Creek downstream of Suma Park Dam must be equivalent to the flow in Summer Hill Creek at the Icely Road gauge (421185); or
      ii. Above 1 ML/day, the flow of water released into the Summer Hill Creek downstream of Suma Park Dam must be 1 ML/day (or greater).

3. The Water Treatment Supervisor shall ensure an alarm system is in place for flows at the Third Crossing with the following alert status:
   - Green: flows > 10 ML/day
   - Orange: flows < 10 ML/day
   - Red: flows < 3 ML/day

   Actions required at each alert level are listed in Table 3.2.

   This is to ensure environmental flow rule B is achieved.

4. The first time flow at the Summer Hill Creek at Icely Road gauge (421185) goes above 7 ML/day in December, January or February, then:
   1. Increase the release from Suma Park Dam to 7 ML/day;
   2. Continue the release for a maximum of 18 days or until the flow at Icely Road falls back to below 7 ML/day.

   This is to ensure environmental flow rule C(i) is achieved.

5. The first time flow at the Summer Hill Creek at Icely Road gauge (421185) goes above 4.3 ML/day in March, April or May, then:
   1. Increase the release from Suma Park Dam to 4.3 ML/day;
   2. Continue the release for a maximum of 17 days or until the flow at Icely Road falls back to below 4.3 ML/day.

   This is to ensure environmental flow rule C(ii) is achieved.
6 The Water Treatment Supervisor shall suspend all environmental flow releases from Suma Park Dam when the combined storage volume of Suma Park Dam, Gosling Creek Reservoir and Spring Creek Reservoir measures less than 25%.

This is to ensure environmental flow rule D is achieved.

7 If environmental flow releases have been suspended due to Action 6 The Water Treatment Supervisor shall recommence environmental flow releases from Suma Park Dam when the combined storage volume of Suma Park Dam, Gosling Creek Reservoir and Spring Creek Reservoir exceeds 30%.

This is to ensure environmental flow rule D is achieved.

8 All data for environmental flow releases is to be recorded electronically.

Who: The Water Treatment Manager is responsible for Action 1.

The Water Treatment Supervisor is responsible for Actions 2 to 8.

Records: • Letter to DoI Water
• Training register.
• Email records.
• Flow data records and annual hydrology report.

Table 3.2 – Third Crossing flow alert levels

<table>
<thead>
<tr>
<th>Alert Level</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green</td>
<td>- No specific action</td>
</tr>
</tbody>
</table>
| Orange      | - Observe flow trends and weather forecasts.  
- Keep a watching brief. |
3.5 HYDROLOGY REPORTING

3.5.1 MONTHLY EXTRACTION REPORT

When: Completed within two working weeks following month end

Actions: 1 The Water Treatment Manager shall coordinate the preparation of the monthly extraction report.

2 The monthly report shall present data for the preceding month and include:
   - The month being reported
   - A summary of the current operating rules defined by the DST
   - A complaints summary
   - Flows and pump run times for:
     - Macquarie River downstream of Long Point (pump offtake point) (421192) (ML/day)
     - MOP PS1 (ML/day)
     - MOP PS 1 pump run time (hours per day)
     - MOP PS 1 pump rate (L/s)
     - Summer Hill Creek at the Third Crossing bridge (421197) (ML/day)
     - BSCSHS PS 1 (ML/day)
     - BSCSHS PS 2 (ML/day)
     - BSCSHS PS 3 (ML/day)
     - PCSHS PS 4 (ML/day)
     - PCSHS PS 5 (ML/day)
     - PCSHS PS 6 (ML/day)
     - Ploughmans PS 7 (ML/day)
     - Showground/Margaret Street Depot Bores (ML/day)
     - Clifton Grove Bores - Shearing Shed and Bore No. 5 (ML/day)
   - Monthly totals for each of the above


4 Monthly extraction reports will remain on the website for 12 months. That is, after 12 months of operation, there will be 12 monthly extraction reports available on the website on a rolling basis.
Who: The Water Treatment Manager shall be responsible for the coordination and publishing of monthly extraction reports.

Records: Monthly extraction report.

3.5.2 ANNUAL HYDROLOGY REPORT

When: Completed in the July each year

Actions: 1 The Water Treatment Manager shall coordinate the preparation of the annual hydrology report to allow completion of the annual review by 1 September each year.

2 The annual hydrology report shall present data for the preceding water year and include:
   - The water year being reported
   - A summary of the operating rules defined by the DST that applied throughout the year and any changes that were adopted
   - A summary of flow data for all of the stream flow monitoring sites listed in Section 3.2.1 including as a minimum:
     - Monthly and annual volumes – tables and/or graphs;
     - Flow statistics including average, minimum and maximum daily values;
     - Flow percentiles;
     - How the reporting year flows compared to long term data (modelled or actual).

   - A summary of extraction data for all of the extraction monitoring sites listed in Section 3.2.1 including as a minimum:
     - Monthly and annual volumes – tables and/or graphs;
     - Pump run times – number of days/hours per year;
     - Annual percentage of flow extracted from surface waters;
     - Comparison of actual demand vs predicted demand;
     - Comparison with licensed extraction limits;
     - A statement that the extraction limits have or have not been within licence limits.

   - Storage plots for:
     - Suma Park Dam;
     - Spring Creek Dam;
     - Gosling Creek Reservoir; and
     - the stormwater holding pond.
• Periods of transfers from Spring Creek Dam and associated transfer volumes.
• Review of actual combined storage behaviour vs the predicted behaviour from the DST Water Year Analysis.
• A system water balance based on the water balance included in Appendix A.
• Specific review on the following operational data:
  – Macquarie River downstream of Long Point (pump offtake point) (421192) and pump operation data to demonstrate compliance with operating rules; and
  – Summer Hill Creek at Icely Road gauge data (421185), Suma Park Dam environmental flow release pipe (station 421196) and Summer Hill Creek at Third Crossing bridge (421197) data to demonstrate compliance with the environmental flow rules.
• The annual hydrology report shall:
  – Identify any non-compliance over the last year, and describe what actions were (or are being) taken to ensure compliance;
  – Identify any trends in the monitoring data over the life of the development;
  – Identify any discrepancies between the predicted and actual impacts of the development, and analyse the potential cause of any significant discrepancies; and
  – Identify measures that could be implemented to improve the environmental performance of the development and justification for any decision to not implement those measures.

3 The annual hydrology report shall be included as an appendix to the Annual Review document that will be submitted on 1 September each year (refer to Section 4.4 – OEMP Reporting).

4 The Annual Review will be available on OCC web site – refer to the Attachment H: Stakeholder Engagement Plan and Section 4.4 – OEMP Reporting.

Who: The Water Treatment Manager shall be responsible for the preparation of the annual hydrology report.

Records: Annual hydrology report for each water year.
3.5.3 BREACH OF WAL CONDITION

When: If required

Actions:

1. Once OCC becomes aware of a breach of the WAL, the Water and Sewerage Strategic Manager must notify the Minister as soon as practicable.

2. The Minister must be notified by:
   - Email: water.enquiries@dpi.nsw.gov.au; or
   - Telephone: 1800 353 104

3. Any notification by telephone must also be confirmed in writing within seven (7) business days of the phone call.

Who: The Water and Sewerage Strategic Manager is responsible for notifying the Minister if required.

Records: Email, phone record and letter.

3.6 HMP REVIEW

3.6.1 REVISION TO STRATEGIES, PLANS AND PROGRAMS

CoA C6 requires that OCC shall review, and if necessary revise, strategies, plans and programs included in the OEMP to the satisfaction of the Director-General within 3 months of:

a) the Annual Review (Section 4.4 – OEMP Reporting);
b) any Incident Report (Section 3.2.18 – Environmental Incident Management);
c) an Audit Report (Section 5.3 – Environmental Auditing and Compliance); or
d) any modification to the conditions of the Project Approval,

This is to ensure that plans and programs are updated on a regular basis, and incorporate any recommended measures to improve environmental performance.

3.6.2 DOCUMENT CONTROL

The following will be classed as ‘major’ revisions:

- Changes to processes;
- Changes to monitoring programs, either timing or parameters monitored;
- Changes made in response to an incident; and/or
- Changes requested by a relevant Government agency.

Major revisions will be identified by the whole number in the version number (i.e. 1.0, 2.0, 3.0...) and will be reviewed, approved and re-circulated as necessary.
The following will be classed as ‘minor’ revisions:

- Minor typing and grammar corrections;
- Changes to position titles; and
- Updates to recording forms to suit changes in operations.

Minor revisions will be identified by the decimal point in the version number (i.e. 1.1, 2.2, 3.3....) and will not require review and approval prior to re-circulation.

Major and minor revisions will be listed in the Revision History at the front of this document.
Appendix A: Calculation of town water extraction
OCC’S EXTRACTION FOR TOWN WATER SUPPLY

Orange City Council currently holds a licence authorising surface water extraction of 8,500 ML/annum from the Macquarie River catchment. Consultation with the DoI Water for various harvesting schemes has confirmed that Council is entitled to develop alternative points of extraction under the current licence, provided these are located within the unregulated section of the Macquarie system, and provided that the total extraction does not exceed the licensed amount of 8,500 ML in any year. [1]

ACCOUNTING FOR TOWN WATER SUPPLY VOLUME

Suma Park Dam is the receival point for harvested water from stormwater, bores and the Macquarie River. It is also the withdrawal point for the town water supply. A storage balance is represented in Figure 2.

The storage balance is represented by the following equation:

\[ S_{t+1} = S_t + \text{Inflow} - \text{Eflow} + \text{Harvest} + \text{Rain} - \text{Evaporation} - \text{Demand} - \text{Spill} \]

Equation 1

Where:

- \( S_{t+1} \) = storage at the end of year one
- \( S_t \) = storage at the start of year
- Inflow = catchment runoff
- Eflow = releases for environmental flow
- Harvest = input from external raw water sources (stormwater, Macquarie River)
- Rain = direct rainfall onto the water surface
- Evaporation = evaporation losses from the water surface

[1] Any harvested stormwater would form part of this 8,500 ML entitlement. After transferral to Suma Park, the subsequent extraction of this water (for delivery to the Icely Road WFP) would not be “double counted” or deducted a second time from the cap entitlement.
Spill = uncontrolled discharges when the storage is above full supply level  
Demand = water drawn for town water supply purposes

Assuming the change in storage is represented by $\Delta S$, then:

$$\Delta S = S_{t+1} - S_t$$

where a positive number means the storage has increased over the year and a negative value means the storage has decreased

Ignoring direct rainfall and evaporation losses, Equation 1 simplifies to:

$$\Delta S = \text{Inflow} - \text{Eflow} + \text{Harvest} - \text{Demand} - \text{Spill}$$  \hspace{1cm} \text{Equation 2}

Rearranging Equation 2 gives,

$$\text{Demand} = \text{Inflow} - \text{Eflow} - \text{Spill} + \text{Harvest} - \Delta S$$  \hspace{1cm} \text{Equation 3}

The net surface water captured by the dam (i.e. inflow minus eflow minus spill), water extracted using various harvesting schemes (stormwater and Macquarie River) and water removed from storage all represent water “taken” from the unregulated water source. Therefore, the “demand” calculated using Equation 3 represents the volume that should be reported as the amount extracted for town water supply purposes. As such, records of the volume transferred from Suma Park Dam to the Icely Road water filtration plant provide the records for annual water accounting against licence limits.

Some examples are provided on the following pages to justify using the raw water demand as a measure of town water extraction.

**Example 1**

Suma Park Dam starts and ends the year below full supply level; therefore spill = 0. The storage at the start of the year is 10,000 ML and it is 10,800 ML at the end of the year.

![Water balance diagram](image)

From equation 3:

$$\text{Demand} = 5000 - 500 - 0 + 1700 - 800$$
$$= 5400$$
$$= \text{Demand}$$

The increase in storage is still “in the catchment system” – it has not been used yet.
Example 2

Suma Park Dam starts and ends the year at full supply level.

Figure 4: Water balance – example 2

From equation 3:

\[
\text{Demand} = 5000 - 500 - 800 + 1700 - 0
\]
\[= 5400\]
\[= \text{Demand}\]

Example 3

Suma Park Dam starts and ends the year below full supply level; therefore spill = 0. The storage at the start of the year is 15,000 ML and it is 13,800 ML at the end of the year.

Figure 5: Water balance – example 3

From equation 3:

\[
\text{Demand} = 3000 - 500 - 0 + 1700 - (-1200)
\]
\[= 2500 + 1700 + 1200\]
\[= 5400\]
\[= \text{Demand}\]

The decrease in storage is water “taken” from the system
Example 4

Suma Park Dam starts and ends the year below full supply level; therefore spill = 0. The storage at the start of the year is 15,000 ML and it is 15,000 ML at the end of the year; no change in storage.

From equation 3:

\[ \text{Demand} = 4000 - 500 - 0 + 1700 - 0 \]
\[ = 5200 \]
\[ = \text{Demand} \]

In this example, the volume of water “taken” out of the catchment is the amount captured as inflow (less Eflow) and the amount added by the harvesting schemes.
Example 5

Suma Park Dam starts and ends the year below full supply level; therefore spill = 0. The storage at the start of the year is 15,000 ML and it is 12,700 ML at the end of the year. Low catchment runoff year, large harvesting volume.

\[ \Delta S = -2300 \]

Figure 7: Water balance – example 5

From equation 3:

\[
\text{Demand} = 1000 - 300 - 0 + 3000 - (-2300) \\
= 1500 + 3000 + 2300 \\
= 6000 \\
= \text{Demand}
\]
Example 6

Suma Park Dam starts below full supply level but spills during the year.

The storage at the start of the year is 17,000 ML and it is 18,800 ML at the end of the year.

Large catchment runoff year and low harvest year.

Figure 8: Water balance – example 6

From equation 3:
\[
\text{Demand} = 10000 - 500 - 1900 + 200 - 1800 \\
= 6000 \\
= \text{Demand}
\]

This example demonstrates that the volume of spill from Suma Park Dam needs to be recorded. This could be determined from inflow records on spill days.
Attachment F

SCOUR WATER MANAGEMENT PLAN
## Revision History

<table>
<thead>
<tr>
<th>Version</th>
<th>Revision Date</th>
<th>Details</th>
<th>Authorised</th>
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<td>1.0</td>
<td>4/12/15</td>
<td>Draft for review</td>
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<td>2.0</td>
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<td>08/04/16</td>
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<td>15/06/18</td>
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# ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>AEMP</td>
<td>Aquatic Environmental Monitoring Program</td>
</tr>
<tr>
<td>AHD</td>
<td>Australian height datum</td>
</tr>
<tr>
<td>AMS</td>
<td>Adaptive management strategy</td>
</tr>
<tr>
<td>ANZECC</td>
<td>Australian and New Zealand Environment and Conservation Council</td>
</tr>
<tr>
<td>ARMCANZ</td>
<td>Agriculture and Resource Management Council of Australia and New Zealand</td>
</tr>
<tr>
<td>BSCSHS</td>
<td>Blackmans Swamp Creek stormwater harvesting scheme</td>
</tr>
<tr>
<td>CCS</td>
<td>Community communication strategy</td>
</tr>
<tr>
<td>CTF</td>
<td>Cease to flow</td>
</tr>
<tr>
<td>CoA</td>
<td>Condition of approval</td>
</tr>
<tr>
<td>DST</td>
<td>Decision Support Tool</td>
</tr>
<tr>
<td>DoI</td>
<td>Department of Industry</td>
</tr>
<tr>
<td>EA</td>
<td>Environmental Assessment</td>
</tr>
<tr>
<td>EP&amp;A Act</td>
<td>NSW Environmental Planning and Assessment Act 1979</td>
</tr>
<tr>
<td>GL</td>
<td>Gigalitre (1,000 megalitres)</td>
</tr>
<tr>
<td>GMP</td>
<td>Groundwater monitoring program</td>
</tr>
<tr>
<td>ha</td>
<td>Hectares</td>
</tr>
<tr>
<td>HMP</td>
<td>Hydrology monitoring program</td>
</tr>
<tr>
<td>IMP</td>
<td>Inspection and maintenance plan</td>
</tr>
<tr>
<td>kL</td>
<td>Kilolitre (1,000 litres)</td>
</tr>
<tr>
<td>km</td>
<td>Kilometre (1,000 metres)</td>
</tr>
<tr>
<td>kWhr</td>
<td>Kilowatt hour</td>
</tr>
<tr>
<td>L</td>
<td>Litre (1,000 millilitres)</td>
</tr>
<tr>
<td>LGA</td>
<td>Local Government Area</td>
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<tr>
<td>L/s</td>
<td>Litres per second</td>
</tr>
<tr>
<td>m³</td>
<td>Cubic metre (1,000 litres)</td>
</tr>
<tr>
<td>m³/hr</td>
<td>Cubic metres per hour</td>
</tr>
<tr>
<td>m³/s</td>
<td>Cubic metres per second</td>
</tr>
<tr>
<td>mg/L</td>
<td>Milligrams per litre</td>
</tr>
<tr>
<td>mL</td>
<td>Millilitre</td>
</tr>
<tr>
<td>ML</td>
<td>Megalitre (1 million litres or 1,000 kilolitres)</td>
</tr>
<tr>
<td>ML/day</td>
<td>Megalitres per day</td>
</tr>
<tr>
<td>m</td>
<td>Metre</td>
</tr>
<tr>
<td>mm</td>
<td>Millimetre</td>
</tr>
<tr>
<td>MOP</td>
<td>Macquarie River to Orange pipeline</td>
</tr>
<tr>
<td>OCC</td>
<td>Orange City Council</td>
</tr>
<tr>
<td>OEMP</td>
<td>Operation Environmental Management Plan</td>
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<td>PA</td>
<td>Project approval</td>
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<td>Description</td>
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<td>--------------</td>
<td>---------------------------------------</td>
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<td>PCSHS</td>
<td>Ploughmans Creek stormwater harvesting scheme</td>
</tr>
<tr>
<td>ScWMP</td>
<td>Scour water management plan</td>
</tr>
<tr>
<td>SEP</td>
<td>Stakeholder engagement plan</td>
</tr>
<tr>
<td>STP</td>
<td>Sewage treatment plant</td>
</tr>
<tr>
<td>µg/L</td>
<td>Micrograms per litre</td>
</tr>
<tr>
<td>µS/cm</td>
<td>Micro Siemens per centimetre</td>
</tr>
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<td>WAL</td>
<td>Water access licence</td>
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<tr>
<td>WFP</td>
<td>Water filtration plant</td>
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<td>WSP</td>
<td>Water sharing plan</td>
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</table>
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Standard Drawing SD 5-4
Standard Drawing SD 6-7
Standard Drawing SD 6-8
Standard Drawing SD 6-11
Standard Drawing SD 6-12

FORMS
Form ScWMP-01
Background

1.1 INTRODUCTION

This Scour Water Management Plan (ScWMP) forms part of the Orange Raw Water Supply Operational Environmental Monitoring Plan (OEMP).

It has been developed to manage the release of scour water during operation of the Macquarie River to Orange Pipeline.

1.2 SCOUR WATER

Scour water is generated during pipeline cleaning or if a section of the pipeline needs to be de-watered for maintenance or inspection. Scour valves are located at low points along the pipeline and water is released from these points to remove water from the pipeline.

Specific approval requirements are provided below.

Project Approval for the Macquarie River to Orange pipeline

Condition C5(a)(iii) of the Project Approval outlines the requirement to monitor and report on scour water as follows:

C5 To compare the actual performance of the Project against that predicted in documents in condition A2, annually from the date of this approval (or other timing as may be agreed by the Director-General), the Proponent shall prepare a summary of the environmental performance of the Project during construction and operation to the satisfaction of the Director-General. This summary must:

(a) Describe the activities that were carried out in the previous year, and the activities that are proposed to be carried out over the next year including:

(i) Monitoring of the extraction process, quantity of water extracted, flow in the river during extraction, duration of extraction and flows in Summer Hill creek;

(ii) Raw water quality in the Macquarie river and Suma Park Dam during extraction; and

(iii) Quantities and quality of scour water to be released during maintenance or emergency activities
**Environmental Assessment**

Section 26.4.4 of the EA stated that a scour water management plan would be developed for the Macquarie River to Orange Pipeline.

### 1.3 SCWMP OBJECTIVES

The preferred approach for the management of scour water is to discharge it to the environment in a controlled manner if relevant water quality standard are met. Alternatively, scour water would be collected from the scour points by tanker and transferred to a designated discharge point.

This ScWMP:

- Provides background data that supports the development and rationale of the scour water management plan;
- Provides details of the scour points along the pipeline including location, property ownership and volume of water in the pipeline at each scour point; and
- Includes specific actions for the release of scour water including water quality targets and water release methodology and procedures.
Background Data

2.1 SCOUR VALVES

There are 71 scour valves located along the Macquarie River to Orange pipeline made up of three different types:

- Type 1 – (17 number) scour valve and section valve combination with the scour valve discharging to an offset 1200 mm diameter pit.
- Type 2 – (18 number) scour valve discharging to an offset 1200 mm diameter pit.
- Type 3 – (36 number) scour valve located over pipe in 1200 mm diameter pit with 80 mm hydrant yoke.

The three scour valve arrangements are shown on Drawing A1324400-07-001-C002.

The offset scour pits are designed to discharge scour water at a controlled velocity. When a scour valve is opened, water fills this pit, slowly rises and mushrooms out of the top of the pit at ground level. The pit is designed to lower the discharge velocity. It also traps some sediment.

Scour water would mainly be released from Type 1 and Type 2 scour valves (those with offset pits). The likelihood of using a Type 3 scour valve for release of scour water is very low.

Details of the scour valves along the pipeline are provided in Appendix A including:

- Scour valve number;
- Rising main – the pipeline is divided into three sections: Rising main 1 – from Pump Station 1 to Pump Station 2; Rising main – from Pump Station 2 to Pump Station 3; and rising main 3 – from Pump Station 3 to Suma Park Dam;
- Coordinates;
- Pipeline chainage;
- Scour valve type;
- Land tenure – private, crown land, road reserve;
- Ownership for private land; and
- The volume of water in the pipeline at each scour point – calculated as the volume of water in the pipeline between the air release valves either side of the scour valve.

Scour valve locations are shown on Figures 1, 2 and 3.
Figure 1: Scour valve locations – Sheet 1
Figure 2: Scour valve locations – Sheet 2
Figure 3: Scour valve locations – Sheet 3
2.2 SCOUR WATER MANAGEMENT RATIONALE

2.2.1 CLEANING OR MAINTENANCE

Scour water can be generated during pipeline cleaning or if a section of the pipeline needs to be de-watered for maintenance or inspection. It is considered that the need to release scour water will derive mainly from maintenance or inspection, rather than cleaning, due to the following:

- Water in the pipeline will be moved at least monthly for pump maintenance reasons, this should move any solids/sediments along the pipeline; and
- The source of the water is the Macquarie River, and triggers are set not to take water with high turbidity. An assessment of potential pipeline fouling concluded that there is unlikely to be significant particulate accumulation, and it is unlikely that the turbidity in the Macquarie River, even at higher values, poses a significant threat of sediment accumulation (City Water Technology, 2014). Mixing studies on Suma Park Dam showed significant dilution (Cardno, 2013). Therefore, if the pipeline needs to be flushed, it could be flushed through to Suma Park Dam without significant detrimental impact on water quality in the dam.

Therefore, the most likely reason for release of scour water is for maintenance (planned or emergency) or inspection.

2.2.2 SCOUR WATER DISPOSAL

The preferred approach for the management of scour water is to discharge it to the environment in a controlled manner if relevant water quality standard are met. Alternatively, scour water would be collected from the scour points by tanker and transferred to a designated discharge point.

The designated discharge point is the stormwater harvesting holding pond.

2.2.3 SCOUR WATER QUALITY

2.2.3.1 Considerations

Relevant factors to consider for setting scour water quality release criteria are:

- The pipeline will only contain river water. The constituents in this water will only be what is present in the catchment; i.e. nothing is added to the water and there are no additional pollutants that are not otherwise found in the catchment.
- Operating rules for the pipeline have been set to avoid transferring high turbidity water. The system will not operate if the river water turbidity goes above 60 NTU. Therefore the pipeline will not contain high turbidity water.
- Routine movement of water along the pipeline for pump maintenance purposes will keep the water in the pipeline fresh.
Sediment would be one of the parameters of concern for release of scour water. A commonly accepted discharge limit for total suspended solids (TSS) is 50 mg/L (e.g. Landcom (2004) Managing Urban Stormwater Soils and Construction – the “Blue Book”). The issue with using TSS as a discharge criteria is that it is a laboratory test and turnaround times would be difficult to manage, particularly for emergency works (if required).

- Turbidity can be easily measured in the field. Review of the Macquarie River water quality data shows the TSS:Turbidity ratio is approximately 1.6. This indicates a turbidity of around 30 NTU would approximate a TSS of 50 mg/L

### 2.2.3.2 Quality Assessment Criteria

The water quality assessment criteria to be used for the management of scour water are summarised in **Table 2.1**. The discharge criteria are based on using turbidity as an indicator.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Discharge to the environment</th>
<th>Discharge to stormwater holding pond</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turbidity, NTU</td>
<td>&lt; 30</td>
<td>&gt; 30</td>
</tr>
</tbody>
</table>
Scour Water Management

3.1 OPERATING YEAR

The operating year is defined as 1 July to 30 June.

This is to be consistent with the water year as used by the NSW Department of Industry – Water (DoI Water) for reporting under the Water Management Act 2000.

All reporting will be consistent with the operating year and will be reported for the year ending 30 June.

3.2 RELEASE OF SCOUR WATER

When: As required.

Actions:

1 Identify where the pipeline scour water needs to be released. Using data in Appendix A and/or field coordinates:
   • Identify the scour valve number and type
   • Identify if on public or private land:
     – if public land, AND scour water will not enter private land, go to Action 3
     – if public land, AND scour water will enter private land, go to Action 2
     – if private land go to Action 2

2 Contact the land owner to advise of the need to access the scour valve or discharge scour water onto private land in accordance with Section 3.3. Maintain record of contact on Form ScWMP-01.

3 Inspect the site and obtain a 5 – 10 litre sample of water from the pipeline in a clean bucket. Test the water sample using a calibrated water quality meter for water quality parameters listed in Table 2.1. Steps to follow when using the water quality meter:
   • Calibrate the field meter as required by the operating manual prior to undertaking the field testing
   • Place probes in bucket and allow readings to stabilise
   • Cleaning (rinsing) of field meter test probes with distilled water between test(s)/locations
   • Record field measurements on Form ScWMP-01.
4 Using the field measurements from Action 3 and the quality criteria listed in Table 2.1, determine the permissible options for scour water disposal. Record options on Form ScWMP-01.

5 If **Discharge to the Environment** is a permissible option:
   - If required, advise the land owner that the scour water will be discharged to the environment.
   - Identify a stable discharge location.
   - Install temporary sediment control structures as required to suit site conditions at the discharge location to trap sediment and minimise erosion, this may include:
     - Rock check dams in drainage lines (Standard Drawing SD 5-4)
     - Straw bale filter (Standard Drawing SD 6-7)
     - Sediment fence (standard Drawing SD 6-8)
     - Alternate sediment fence (standard Drawing SD 6-8)
     - Mesh and gravel inlet filter (Standard Drawing SD 6-11)
     - Geotextile inlet filter (Standard Drawing SD 6-12)
     - Sludge dewatering bag
     - Or other suitable control as determined by the on-site supervisor
   - Ensure the sediment trap discharges to a stable location.
   - Keep a record on Form ScWMP-01 of the sediment control measures installed.
   - Commence discharge of scour water. Record the time scour water discharge commences on Form ScWMP-01.
   - Adjust the scour valve to ensure the scour water leaves the scour pit at a controlled velocity and is not causing erosion to downstream areas.
   - Inspect the discharge point and sediment controls at regular intervals during discharge. Maintain as required.
   - Cease scour water discharge if erosion is occurring at the discharge location. Either:
     1. Fix the erosion and install additional sediment control as required; and/or
     2. Reduce the rate of scour water release; and/or
     3. Arrange for transport of scour water off-site.
• At the completion of scour water discharge:
  – Record the time scour water discharge finished on Form ScWMP-01.
  – Check the site discharge point and areas downstream and remove temporary sediment controls if the site is stable.
  – Repair any areas of erosion and install and leave in place temporary controls to prevent further erosion. Note the need for a follow-up inspection on Form ScWMP-01.

7 If Discharge to the stormwater holding pond is a permissible option:
• Commence removal of scour water to tanker. Record the time scour water discharge commences on Form ScWMP-01.
• At the completion of scour water discharge:
  – Record the time scour water discharge finished on Form ScWMP-01.
  – Repair any areas of erosion and install and leave in place temporary controls to prevent further erosion. Note the need for a follow-up inspection on Form ScWMP-01.

8 Submit Form ScWMP-01 to the Works Engineer – Water and Sewer for approval.

Who: The Water and Sewer Engineer shall be responsible for:
• Ensuring field crews follow this procedure.
• Making contact with land owners if required and keeping a record on Form ScWMP-01.
• Approving records using Form ScWMP-01.

The Team Leader shall be responsible for:
• Following this procedure.
• Field monitoring and recording.
• Keeping records on using Form ScWMP-01.
• Submitting records to the Water and Sewer Engineer for approval.

Records: A record of scour water release will be maintained using Form ScWMP-01.
3.3  NOTIFICATION OF LAND OWNERS

When:  Required if:

1. A scour valve is located in private land; or
2. Scour water discharged from a scour valve on public land is likely to enter private land.

Actions:  1  If scheduled maintenance:

- Identify scour valve location(s) and affected land owner(s)
- Advise each land owner at least two (2) days prior to undertaking the work using one, or all, of the following methods:
  - In writing
  - Phone call
  - Door knocking

2  If unplanned/emergency work:

- Identify scour valve location(s) and affected land owner(s)
- Contact the land owner by telephone as soon as practicable once aware of the need to scour the pipeline; and/or
- Contact the land owner by door knocking on the day of the unplanned/emergency work.

Who:  The Water and Sewer Engineer shall be responsible for:

- Making contact with land owners in accordance with this procedure.
- Maintaining records using Form ScWMP-01.

Records:  A record of land owner contact will be maintained using Form ScWMP-01.
3.4 **INSPECTION AND REPAIR OF SCOUR DISCHARGE POINTS**

**When:** Required if a scour release record indicates that follow-up inspection is required.

**Actions:**

1. The Water and Sewer Engineer shall advise reticulation crews of the need to undertake a follow-up inspection(s).

2. The Water and Sewer Engineer shall contact affected land owners by telephone (if access to private land is required).

3. Reticulation crews shall:
   - Check the site discharge point and areas downstream and remove temporary sediment controls if the site is stable. Note site closure on Form ScWMP-01.
   - Repair any areas of erosion and install and leave in place temporary controls to prevent further erosion if required. Note the need for a further follow-up inspection on Form ScWMP-01.

4. Submit Form ScWMP-01 to the Water and Sewer Engineer for approval.

**Who:**

The **Water and Sewer Engineer** shall be responsible for:
- Co-ordinating follow-up inspections.
- Making contact with land owners in accordance with this procedure.
- Maintaining records using Form ScWMP-01.

The **Team Leader** shall be responsible for:
- Following this procedure.
- Keeping records on using Form ScWMP-01.
- Submitting records to the Water and Sewer Engineer for approval.

**Records:** A record of follow-up inspection will be maintained using the relevant Form ScWMP-01 (linked to the original activity).
3.5 SCWMP REVIEW

3.5.1 REVISION TO STRATEGIES, PLANS AND PROGRAMS

CoA C6 requires that OCC shall review, and if necessary revise, strategies, plans and programs included in the OEMP to the satisfaction of the Director-General within 3 months of:

a) the Annual Review (Section 4.4 – OEMP Reporting);
b) any Incident Report (Section 3.2.18 – Environmental Incident Management);
c) an Audit Report (Section 5.3 – Environmental Auditing and Compliance); or
d) any modification to the conditions of the Project Approval,

This is to ensure that plans and programs are updated on a regular basis, and incorporate any recommended measures to improve environmental performance.

3.5.2 DOCUMENT CONTROL

The following will be classed as ‘major’ revisions:

- Changes to processes;
- Changes to monitoring programs, either timing or parameters monitored;
- Changes made in response to an incident; and/or
- Changes requested by a relevant Government agency.

Major revisions will be identified by the whole number in the version number (i.e. 1.0, 2.0, 3.0...) and will be reviewed, approved and re-circulated as necessary.

The following will be classed as ‘minor’ revisions:

- Minor typing and grammar corrections;
- Changes to position titles; and
- Updates to recording forms to suit changes in operations.

Minor revisions will be identified by the decimal point in the version number (i.e. 1.1, 2.2, 3.3...) and will not require review and approval prior to re-circulation.

Major and minor revisions will be listed in the Revision History at the front of this document.
References

Cardno Pty Ltd (2013) *3D Modelling of Suma Park reservoir*.

Drawings
Construction Notes

1. Check dams can be built with various materials, including rocks, logs, sandbags and straw bales. The maintenance program should ensure their integrity is retained, especially where constructed with straw bales. In the case of bales, this might require their replacement each two to four months.

2. Trench the check dam 200 mm into the ground across its whole width. Where rock is used, fill the trenches to at least 100 mm above the ground surface to reduce the risk of undercutting.

3. Normally, their maximum height should not exceed 600 mm above the gully floor. The centre should act as a spillway, being at least 150 mm lower than the outer edges.

4. Space the dams so the toe of the upstream dam is level with the spillway of the next downstream dam.
**Construction Notes**

1. Construct the straw bale filter as close as possible to being parallel to the contours of the site.

2. Place bales lengthwise in a row with ends tightly abutting. Use straw to fill any gaps between bales. Straws are to be placed parallel to ground.

3. Ensure that the maximum height of the filter is one bale.

4. Embed each bale in the ground 75 mm to 100 mm and anchor with two 1.2 metre star pickets or stakes. Angle the first star picket or stake in each bale towards the previously laid bale. Drive them 600 mm into the ground and, if possible, flush with the top of the bales. Where star pickets are used and they protrude above the bales, ensure they are fitted with safety caps.

5. Where a straw bale filter is constructed downslope from a disturbed batter, ensure the bales are placed 1 to 2 metres downslope from the toe.

6. Establish a maintenance program that ensures the integrity of the bales is retained - they could require replacement each two to four months.
Construction Notes

1. Construct sediment fences as close as possible to being parallel to the contours of the site, but with small returns as shown in the drawing to limit the catchment area of any one section. The catchment area should be small enough to limit water flow if concentrated at one point to 50 litres per second in the design storm event, usually the 10-year event.

2. Cut a 150-mm deep trench along the upslope line of the fence for the bottom of the fabric to be entrenched.

3. Drive 1.5 metre long star pickets into ground at 2.5 metre intervals (max) at the downslope edge of the trench. Ensure any star pickets are fitted with safety caps.

4. Fix self-supporting geotextile to the upslope side of the posts ensuring it goes to the base of the trench. Fix the geotextile with wire ties or as recommended by the manufacturer. Only use geotextile specifically produced for sediment fencing. The use of shade cloth for this purpose is not satisfactory.

5. Join sections of fabric at a support post with a 150-mm overlap.

6. Backfill the trench over the base of the fabric and compact it thoroughly over the geotextile.
NOTE: This practice only to be used where specified in an approved SWMP/ESCP.

Construction Notes

1. Install filters to kerb inlets only at sag points.

2. Fabricate a sleeve made from geotextile or wire mesh longer than the length of the inlet pit and fill it with 25 mm to 50 mm gravel.

3. Form an elliptical cross-section about 150 mm high x 400 mm wide.

4. Place the filter at the opening leaving at least a 100-mm space between it and the kerb inlet. Maintain the opening with spacer blocks.

5. Form a seal with the kerb to prevent sediment bypassing the filter.

6. Sandbags filled with gravel can substitute for the mesh or geotextile providing they are placed so that they firmly abut each other and sediment-laden waters cannot pass between.
Construction Notes

1. Fabricate a sediment barrier made from geotextile or straw bales.

2. Follow Standard Drawing 6-7 and Standard Drawing 6-8 for installation procedures for the straw bales or geofabric. Reduce the picket spacing to 1 metre centres.

3. In waterways, artificial sag points can be created with sandbags or earth banks as shown in the drawing.

4. Do not cover the inlet with geotextile unless the design is adequate to allow for all waters to bypass it.
Forms
Form ScWMP-01: Scour Water Record

WATER YEAR: 1 July ____________ to 30 June ____________

WORK TYPE (tick): [Scheduled] [Unplanned/emergency]

SCOUR VALVE NUMBER: _______________ Type: [1] [2] [3]

LAND TYPE: [Public Road] [Crown Land] [Private]

If private: Owner: ________________________________

   Owner Contacted: Letter Date: ___________ Initials: ___________
   Phone Date: ___________ Initials: ___________
   Door Knock Date: ___________ Initials: ___________

POTENTIAL VOLUME: ____________ kL

DATE OF SCOUR WATER RELEASE: ____________

WATER TESTING:

<table>
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<tr>
<th>PARAMETER</th>
<th>SCOUR WATER SAMPLE</th>
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<tr>
<td>Time</td>
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<tr>
<td>Turbidity, NTU</td>
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</tr>
<tr>
<td>Permissible Use</td>
<td>Environment</td>
</tr>
<tr>
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<td>Holding Pond</td>
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SEDIMENT TRAP INSTALLED?

If Other: _______________________

Scour Water Discharge: Time Start ____________ Time Stop ____________

Number of tankers ____________ Estimated Volume ____________ kL

Follow-up Inspection of discharge area required? [Yes] [No]

Follow-up inspection completed: Date ____________

Site Closure: [Yes] [No] Date ____________

Completed by:

Team Leader: __________________ Signature: __________________ Date: ____________

Approved by:

Water and Sewer Engineer: __________________ Signature: __________________ Date: ____________
Appendix A – Scour Valve Data
<table>
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### ABBREVIATIONS

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<tr>
<td>AEMP</td>
<td>Aquatic Environmental Monitoring Program</td>
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<td>AHD</td>
<td>Australian height datum</td>
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<tr>
<td>AMS</td>
<td>Adaptive management strategy</td>
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<td>ANZECC</td>
<td>Australian and New Zealand Environment and Conservation Council</td>
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<td>ARMCANZ</td>
<td>Agriculture and Resource Management Council of Australia and New Zealand</td>
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<tr>
<td>CCS</td>
<td>Community communication strategy</td>
</tr>
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<td>CTF</td>
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<td>CoA</td>
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</tr>
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<td>DST</td>
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<td>DoI</td>
<td>Department of Industry</td>
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<tr>
<td>EA</td>
<td>Environmental Assessment</td>
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<td>EP&amp;A Act</td>
<td>NSW Environmental Planning and Assessment Act 1979</td>
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<tr>
<td>GL</td>
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<td>GMP</td>
<td>Groundwater monitoring program</td>
</tr>
<tr>
<td>ha</td>
<td>Hectares</td>
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<tr>
<td>HMP</td>
<td>Hydrology monitoring program</td>
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<tr>
<td>IMP</td>
<td>Inspection and maintenance plan</td>
</tr>
<tr>
<td>kL</td>
<td>Kilolitre (1,000 litres)</td>
</tr>
<tr>
<td>km</td>
<td>Kilometre (1,000 metres)</td>
</tr>
<tr>
<td>kWhr</td>
<td>Kilowatt hour</td>
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<tr>
<td>L</td>
<td>Litre (1,000 millilitres)</td>
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<td>LGA</td>
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<td>L/s</td>
<td>Litres per second</td>
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<tr>
<td>m³</td>
<td>Cubic metre (1,000 litres)</td>
</tr>
<tr>
<td>m³/hr</td>
<td>Cubic metres per hour</td>
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<tr>
<td>m³/s</td>
<td>Cubic metres per second</td>
</tr>
<tr>
<td>mg/L</td>
<td>Milligrams per litre</td>
</tr>
<tr>
<td>mL</td>
<td>Millilitre</td>
</tr>
<tr>
<td>ML</td>
<td>Megalitre (1 million litres or 1,000 kilolitres)</td>
</tr>
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<td>ML/day</td>
<td>Megalitres per day</td>
</tr>
<tr>
<td>m</td>
<td>Metre</td>
</tr>
<tr>
<td>mm</td>
<td>Millimetre</td>
</tr>
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<td>MOP</td>
<td>Macquarie River to Orange pipeline</td>
</tr>
<tr>
<td>OCC</td>
<td>Orange City Council</td>
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<td>OEMP</td>
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<td>Abbreviation</td>
<td>Description</td>
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<td>PCHS</td>
<td>Ploughmans Creek stormwater harvesting scheme</td>
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<tr>
<td>ScWMP</td>
<td>Scour water management plan</td>
</tr>
<tr>
<td>SEP</td>
<td>Stakeholder engagement plan</td>
</tr>
<tr>
<td>STP</td>
<td>Sewage treatment plant</td>
</tr>
<tr>
<td>µg/L</td>
<td>Micrograms per litre</td>
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<tr>
<td>µS/cm</td>
<td>Micro Siemens per centimetre</td>
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<td>WAL</td>
<td>Water access licence</td>
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<td>WFP</td>
<td>Water filtration plant</td>
</tr>
<tr>
<td>WSP</td>
<td>Water sharing plan</td>
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PCSHS: Ploughmans Creek stormwater harvesting scheme
ScWMP: Scour water management plan
SEP: Stakeholder engagement plan
STP: Sewage treatment plant
µg/L: Micrograms per litre
µS/cm: Micro Siemens per centimetre
WAL: Water access licence
WFP: Water filtration plant
WSP: Water sharing plan
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*Form IMP-01*
Background

1.1 INTRODUCTION

This Inspection and Maintenance Plan (IMP) forms part of the Orange Raw Water Supply Operational Environmental Monitoring Plan (OEMP).

It has been developed to provide an overview of routine inspection and maintenance regimes for components of the raw water system.

1.2 SCOPE

The IMP covers:

- The Blackmans Swamp Creek stormwater harvesting scheme (BSCSHS);
- The Ploughmans Creek stormwater harvesting scheme (PCSHS);
- Water supply bores; and
- The Macquarie River to Orange pipeline (MOP).

Inspection and maintenance of OCC’s dams is managed under a dam safety monitoring program.

1.3 REQUIREMENT

Specific approval requirements are provided below.

Project Approval for the Macquarie River to Orange pipeline

There are no specific Project Approval conditions relating to inspection and maintenance.

The management of scour water that may be generated during maintenance activities is outlined in the Scour Water Management Plan (Attachment F) and addresses CoA C5.

Environmental Assessment

The outline operational environmental management plan included in the Macquarie River to Orange pipeline environmental assessment included the requirement to manage flora and fauna, property access and traffic. These aspects are included in this IMP.
1.4 STARTING PREMISE

The starting premise is that all construction related activities have been completed and relevant property restoration agreements have been accepted by land owners on which water supply infrastructure is located.
2.1 OPERATING YEAR

The operating year is defined as 1 July to 30 June.

This is to be consistent with the water year as used by the NSW Department of Industry – Water (DoI Water) for reporting under the Water Management Act 2000.

All reporting will be consistent with the operating year and will be reported for the year ending 30 June.

2.2 BIANNUAL INSPECTIONS

When: Required 2 times per water year: Conducted in August and February

Actions: 1 Follow procedure outlined in Section 4.1 if access to private land is required.

2 The Water and Sewer Engineer shall schedule biannual inspection of the:
- MOP
- BSCSHS
- PCSHS; and
- Bores

The scope of the biannual inspection is outlined in Table 2.1.

The Technician shall undertake the biannual inspections.

Who: The Water and Sewer Engineer shall be responsible for:
- Ensuring the biannual inspections are undertaken.
- Approving records using Form IMP-02.

The Technician shall be responsible for:
- Undertaking biannual inspections.
- Maintaining records using Form IMP-01.

Records: Records will be maintained using Form IMP-01.
**Table 2.1 – Routine inspection and maintenance summary**

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<th>Scope</th>
<th>Records</th>
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<td>MOP</td>
<td><strong>MOP:</strong> Drive-by inspection of pipeline route observing:</td>
<td>Form IMP-01</td>
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<td></td>
<td>BSCSHS</td>
<td>- Weeds</td>
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<td></td>
<td>PCSHS</td>
<td>- Vegetation coverage</td>
<td></td>
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<tr>
<td></td>
<td>Bores</td>
<td>- Any suckers within 3 m either side of pipeline</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Third Crossing</td>
<td>- Any areas of erosion</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Any areas of subsidence</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Fencing</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Inspect screens at PS1 intake (if river level low enough)</td>
<td></td>
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<td></td>
<td></td>
<td>- Check data communications</td>
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<tr>
<td></td>
<td></td>
<td><strong>BSCSHS and PCSHS:</strong></td>
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<tr>
<td></td>
<td></td>
<td>- Weirs are free from obstructions</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Any areas of erosion around weirs and harvesting ponds/wetlands</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Any areas of subsidence around weirs and harvesting ponds/wetlands</td>
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<tr>
<td></td>
<td></td>
<td>- Security at pump stations</td>
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</tr>
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<td></td>
<td></td>
<td>- Fencing (where required)</td>
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<td></td>
<td></td>
<td>- Data communications</td>
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<td></td>
<td></td>
<td><strong>Bores:</strong></td>
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<tr>
<td></td>
<td></td>
<td>- Check bore heads and pumps</td>
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<td>- Check meters</td>
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<tr>
<td></td>
<td></td>
<td>- Security and illegal access</td>
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<td></td>
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<td>- Data communications</td>
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<td></td>
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<td><strong>Third Crossing</strong></td>
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</tr>
<tr>
<td></td>
<td></td>
<td>- Weir is free from obstructions</td>
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</table>
General

3.1 SCOUR WATER

Scour water shall be managed in accordance with the Attachment F: Scour Water Management Plan.

3.2 TRAFFIC

All vehicle access shall be via public roads and/or existing formed access tracks.

All OCC staff shall drive to the posted speed limit and/or prevailing conditions.

Lower speeds shall be adopted in dry periods to minimise dust generation.

3.3 KEY STREAM GAUGING STATIONS

Key stream gauging stations shall be maintained under a contract with DoI Water in accordance with the Attachment E: Hydrology Monitoring Program.

3.4 TRAPPED FAUNA

Fauna may become trapped in scour pits, air valve pits or pump wells. Care shall be exercised when opening access pit covers.

WIRES (1300 094 737) shall be contacted in the event that trapped fauna is located during routine inspection and maintenance activities. The trapped fauna shall be monitored until WIRES can safely remove the animal away from the maintenance area.

3.5 NO FISHING

There shall be no fishing from any of the rivers, stream or dams that form part of the Orange raw water supply system during inspection and maintenance activities.

3.6 WEED CONTROL

OCC’s weed control procedures shall be followed if access is required across private land.
4.1 **NOTIFICATION OF LAND OWNERS**

**When:** Required if inspection or maintenance activities are required on private land.

**Actions:**

1. If scheduled maintenance:
   - Identify affected land owner(s)
   - Advise each land owner at least two (2) days prior to undertaking the work using one, or all, of the following methods:
     - In writing
     - Phone call
     - Door knocking

2. If unplanned/emergency work:
   - Identify affected land owner(s)
   - Contact the land owner by telephone as soon as practicable once aware of the need to scour the pipeline; and/or
   - Contact the land owner by door knocking on the day of the unplanned/emergency work.

**Who:** The **Water and Sewer Engineer** shall be responsible for:

- Making contact with land owners in accordance with this procedure.
- Maintaining records using **Form IMP-01**.

**Records:** A record of land owner contact will be maintained using **Form IMP-01**.
4.2 IMP REVIEW

4.2.1 REVISION TO STRATEGIES, PLANS AND PROGRAMS

CoA C6 requires that OCC shall review, and if necessary revise, strategies, plans and programs included in the OEMP to the satisfaction of the Director-General within 3 months of:

a) the Annual Review (Section 4.4 – OEMP Reporting);
b) any Incident Report (Section 3.2.18 – Environmental Incident Management);
c) an Audit Report (Section 5.3 – Environmental Auditing and Compliance); or
d) any modification to the conditions of the Project Approval,

This is to ensure that plans and programs are updated on a regular basis, and incorporate any recommended measures to improve environmental performance.

4.2.2 DOCUMENT CONTROL

The following will be classed as ‘major’ revisions:

- Changes to processes;
- Changes to monitoring programs, either timing or parameters monitored;
- Changes made in response to an incident; and/or
- Changes requested by a relevant Government agency.

Major revisions will be identified by the whole number in the version number (i.e. 1.0, 2.0, 3.0...) and will be reviewed, approved and re-circulated as necessary.

The following will be classed as ‘minor’ revisions:

- Minor typing and grammar corrections;
- Changes to position titles; and
- Updates to recording forms to suit changes in operations.

Minor revisions will be identified by the decimal point in the version number (i.e. 1.1, 2.2, 3.3...) and will not require review and approval prior to re-circulation.

Major and minor revisions will be listed in the Revision History at the front of this document.
Forms
Form IMP-01: Biannual Inspection Record

WATER YEAR: 1 July __________ to 30 June __________

DATE: ______________

If private land access required: Owner: ____________________________________________________________

<table>
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<th>Owner Contacted:</th>
<th>Letter Date:</th>
<th>Initials:</th>
<th>Phone Date:</th>
<th>Initials:</th>
<th>Door Knock Date:</th>
<th>Initials:</th>
</tr>
</thead>
</table>

MOP

1. Pipelines corridor clear of weeds
2. Vegetation coverage adequate (>70% or consistent with adjacent land)
3. Pipeline alignment clear of suckers within 3m either side of pipe
4. Any areas of erosion along the pipeline alignment
5. Any areas of subsidence along the pipeline alignment
6. Pipeline corridor fencing ok
7. Any signs of unwanted activity in pipeline easement
8. River intake screens in place
9. River intake screens free of debris
10. Data communications working

BSCSHS and PCSHS

11. Weirs free from obstructions
12. Any areas of erosion around weirs and harvesting ponds
13. Any areas of subsidence around weirs and harvesting ponds
14. Pump station buildings secure
15. Any signs of unwanted activity at pump stations
16. All relevant security fencing in place and secure
17. Data communications working

Bores

18. Bore head and pumps operational
19. Bore flow meters operational
20. Any signs of unwanted activity at bores and pump stations
21. All relevant security fencing in place and secure
22. Data communications working

Third Crossing

23. Weirs free from obstructions
Non-compliance with checklist

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Follow-up Inspection required?  Yes  No
Follow-up inspection completed:  Date
Site Closure:  Yes  No  Date

Completed by:

<table>
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<th>Signature:</th>
<th>Date:</th>
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Approved by:

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<th>Water and Sewer Engineer</th>
<th>Signature:</th>
<th>Date:</th>
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Attachment H

STAKEHOLDER ENGAGEMENT PLAN
STAKEHOLDER ENGAGEMENT PLAN
RAW WATER SUPPLY OEMP – ATTACHMENT H

JUNE 2018
Revision History

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## ABBREVIATIONS

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<td>AEMP</td>
<td>Aquatic Environmental Monitoring Program</td>
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<td>AHD</td>
<td>Australian height datum</td>
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<tr>
<td>AMS</td>
<td>Adaptive management strategy</td>
</tr>
<tr>
<td>ANZECC</td>
<td>Australian and New Zealand Environment and Conservation Council</td>
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<tr>
<td>ARMCANZ</td>
<td>Agriculture and Resource Management Council of Australia and New Zealand</td>
</tr>
<tr>
<td>BSCSHS</td>
<td>Blackmans Swamp Creek stormwater harvesting scheme</td>
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<tr>
<td>CCS</td>
<td>Community communication strategy</td>
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<tr>
<td>CTF</td>
<td>Cease to flow</td>
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<td>Condition of approval</td>
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<tr>
<td>DEE</td>
<td>Department of Environment and Energy</td>
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<td>DST</td>
<td>Decision Support Tool</td>
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<td>Department of Planning and Environment</td>
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<td>DPI</td>
<td>Department of Primary Industries</td>
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<td>DPI Water</td>
<td>Department of Primary Industries Water</td>
</tr>
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<td>DSEWPC</td>
<td>Department of Sustainability, Environment, Water, Population and Communities (now DEE)</td>
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<td>Environmental Assessment</td>
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<td>EP&amp;A Act</td>
<td>NSW Environmental Planning and Assessment Act 1979</td>
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<tr>
<td>GL</td>
<td>Giga-litre (1,000 megalitres)</td>
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<tr>
<td>GMP</td>
<td>Groundwater monitoring program</td>
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<tr>
<td>ha</td>
<td>Hectares</td>
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<td>HMP</td>
<td>Hydrology monitoring program</td>
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<tr>
<td>IMP</td>
<td>Inspection and maintenance plan</td>
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<tr>
<td>kL</td>
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<tr>
<td>km</td>
<td>Kilometre (1,000 metres)</td>
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<td>Metre</td>
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<td>mm</td>
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MOP  Macquarie River to Orange pipeline  
OCC  Orange City Council  
OEMP  Operation Environmental Management Plan  
PA  Project approval  
PCSHS  Ploughmans Creek stormwater harvesting scheme  
ScWMP  Scour water management plan  
SEP  Stakeholder engagement plan  
STP  Sewage treatment plant  
µg/L  Micrograms per litre  
µS/cm  Micro Siemens per centimetre  
WAL  Water access licence  
WFP  Water filtration plant  
WSP  Water sharing plan
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APPENDIX A – COMMUNITY COMMUNICATION STRATEGY
Background

1.1 INTRODUCTION

This Stakeholder Engagement Plan (SEP) forms part of the Orange Raw Water Supply Operational Environmental Monitoring Plan (OEMP).

It has been developed to ensure effective stakeholder engagement and access to information for the operation of the Orange City Council raw water supply system.

1.2 STAKEHOLDER ENGAGEMENT

Specific approval requirements and commitments made for stakeholder engagement and access to information are provided below.

Project Approval for the Macquarie River to Orange pipeline

Condition C12 of the Project Approval outlines the requirement for access to information as follows:

C12 Within one (1) month of the date of this approval [18 June 2013], and as documents are progressively made available, or as otherwise stated below, or as otherwise agreed by the Director-General, the Proponent shall:

a) make copies of the following publicly available on its website:
   i) the documents referred to in Condition A2;
   ii) all current statutory approvals and licences for the development;
   iii) the Proponent shall investigate real time reporting or at a minimum monthly extraction reports which detail the quantity of water extracted, flow in river during extraction and duration of extraction;
   iv) all approved plans and programs required under the conditions of this approval;
   v) a comprehensive summary of the monitoring results relating to condition B1, reported in accordance with the specifications in any conditions of this consent, or any approved plans and programs;
   vi) operational data updated on a monthly basis, or in real time if feasible, including:
      • the cease to pump trigger level;
      • pumping operations (including pumping times, extraction rate and total volumes extracted daily);
      • river flow rates during pumping; and
      • interactions with the broader water supply system for Orange and the application of the decision support tool (Condition B3);
   vii) a summary of the complaints register, updated on a monthly basis;
viii) the annual reviews of the Project;
ix) any independent environmental audit of the Project, and the Proponent’s response to the recommendations in any audit;
x) any other matter required by the Director-General; and
b) keep this information up to date, to the satisfaction of the Director-General.

Condition C14 of the Project Approval outlines the requirement for a Community Communication Strategy as follows:

C14  A **Community Communication Strategy** shall be prepared and implemented to facilitate communication between the Proponent (and its Contractor(s)), the Environmental Representative (see condition C13), the relevant council and community stakeholders (particularly adjoining landowners) on the construction environmental management and operation of the project. The Strategy shall include, but not limited to:

(a) Identification of stakeholders to be consulted as part of the Strategy, including affected and adjoining landowners;

(b) Procedures and mechanisms for the regular distribution of information to stakeholders on construction progress and matters associated with environmental management and key environmental management issues for the project. The strategy shall provide detail on the structure, scope, objectives and frequency of the distribution of information;

(c) Procedures and mechanisms through which the stakeholders can discuss or provide feedback to the Proponent and/or Environmental Representative in relation to the environmental management and delivery of the project;

(d) Procedures and mechanisms through which the Proponent can respond to enquiries or feedback from the stakeholders in relation to the environmental management and delivery of the Project; and

(e) Procedures and mechanisms that would be implemented to resolve issues/disputes that may arise between parties on the matters relating to the environmental management and the delivery of the Project. This may include the use of an appropriately qualified and experienced independent mediator.

The Proponent shall maintain and implement the Strategy throughout construction and operation of the Project.
**Review of Environmental Factors – Blackmans Swamp Creek Stormwater Harvesting Scheme**

Rule 9 of the Blackmans Swamp Creek Stormwater Harvesting Scheme (BSCSHS) operating rules states:

*Rule 9  Stakeholder Engagement: Representation from downstream stakeholders will be included in any review of the Operating Rules.*

**Review of Environmental Factors – Ploughmans Creek Stormwater Harvesting**

Rule 4 of the Ploughmans Creek Stormwater Harvesting Scheme (PCSHS) operating rules states:

*Rule 4  Stakeholder Engagement: Representation from downstream stakeholders will be included in any review of the Operating Rules.*

**OCC Commitment**

In the NSW Civil and Administrative Tribunal Proceeding No 10/03573, OCC gave a commitment to do the following (amongst other things):

To include in the OEMP:

* (a)(iv)  a requirement for a Stakeholder Reference Group, consisting of relevant local interest groups and individuals, including but not limited to representatives of the Summer Hill Creek Care Group, Ophir Reserve Trust and Mirrabooka Farms.

**1.3 SEP OBJECTIVES**

This SEP:

- Defines the scope and function of the Stakeholder Reference Group;
- Outlines the Community Communication Strategy; and
- Outlines the access to information.
2.1 STAKEHOLDER REFERENCE GROUP

When: On commencement of this OEMP.

Actions: 1 The Water and Sewer Strategic Manager shall invite the following groups by letter to be on the Stakeholders Reference Group (SRG) for the Orange Raw Water Supply system:

- Summer Hill Creek Care Group;
- Ophir Reserve Trust;
- Mirrabooka Farms;
- Landowner representatives in the Ploughmans Creek valley; and
- Orange Trout Acclimatisation Society.

2 Once the SRG has been formed, the Water and Sewer Strategic Manager will write to the SRG advising:

- that the SRG will be consulted if there are any proposed changes to licensed operating conditions;
- the information that OCC will make publically available and how to access this information;
- the timing of various reports that will be published through a water year including the DST Water Year Analysis, DST Quarterly Updates, the Annual Review and any independent audits; and
- what mechanisms are in place to raise questions about the operation of the raw water supply system.

3 A copy of the approved OEMP shall be made available to the SRG via Orange City Council’s web site.

Who: The Water and Sewer Strategic Manager shall be responsible for undertaking Actions 1 to 3.

Records: • Letter of invitation to be on SRG.
- Letter advising of SRG formation and access to information.
2.2 COMMUNITY COMMUNICATION STRATEGY

Refer to the Community Communication Strategy in Appendix A.

2.3 ACCESS TO INFORMATION

When: On commencement of this OEMP.

Actions: 1 The Water and Sewer Strategic Manager shall provide copies of the following documents on the Orange City Council website http://www.orange.nsw.gov.au/site/index.cfm?display=604698

- Macquarie River to Orange Pipeline project documents including:
  - Major Projects Application MP10_0235;
  - Macquarie River to Orange Pipeline Project Environmental Assessment (GHD, August 2012);
  - Macquarie River to Orange Pipeline Project Preferred Project Report (GHD, February 2012);
  - Macquarie River to Orange Pipeline Project – Clarification of Calculations of Permanent and Temporary Vegetation Impacts (letter dated 12 March 2013 from Orange City Council); and
  - The Project Approval (dated 18 June 2013);
- The following statutory approvals and licences:
  - WAL 36161
  - WAL 33891
  - WAL 29148
  - WAL 36374
  - WAL 30283
- Links to the DPI Water real time data website for those sites that have real time data reporting;
- The current version of this OEMP;
- The current operating rules as defined by Attachment C: Decision Support Tool;
- The Monthly Extraction Report (refer to Attachment E: Hydrology Monitoring Program);
- The latest Annual Review completed in accordance with Section 4.4 – OEMP Reporting;
- Any independent environmental audit completed in accordance with Section 4.3 – Environmental Auditing and Compliance; and
2.4  HMP REVIEW

2.4.1  REVISION TO STRATEGIES, PLANS AND PROGRAMS

CoA C6 requires that OCC shall review, and if necessary revise, strategies, plans and programs included in the OEMP to the satisfaction of the Director-General within 3 months of:

a) the Annual Review (Section 4.4 – OEMP Reporting);

b) any Incident Report (Section 3.2.18 – Environmental Incident Management);

c) an Audit Report (Section 4.3 – Environmental Auditing and Compliance); or

d) any modification to the conditions of the Project Approval,

This is to ensure that plans and programs are updated on a regular basis, and incorporate any recommended measures to improve environmental performance.

2.4.2  DOCUMENT CONTROL

The following will be classed as ‘major’ revisions:

- Changes to processes;
- Changes to monitoring programs, either timing or parameters monitored;
- Changes made in response to an incident; and/or
- Changes requested by a relevant Government agency.

Major revisions will be identified by the whole number in the version number (i.e. 1.0, 2.0, 3.0....) and will be reviewed, approved and re-circulated as necessary.
The following will be classed as ‘minor’ revisions:

- Minor typing and grammar corrections;
- Changes to position titles; and
- Updates to recording forms to suit changes in operations.

Minor revisions will be identified by the decimal point in the version number (i.e. 1.1, 2.2, 3.3...) and will not require review and approval prior to re-circulation.

Major and minor revisions will be listed in the Revision History at the front of this document.
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# ACRONYMS

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<td>CoA</td>
<td>Conditions of Approval</td>
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<td>Department of Planning and Infrastructure</td>
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<td>Department of Primary Industries</td>
</tr>
<tr>
<td>OEH</td>
<td>Office of Environment and Heritage</td>
</tr>
<tr>
<td>DPC</td>
<td>Department of Premier and Cabinet</td>
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</table>
1.1 Document outline
This document has been prepared and will be implemented to facilitate communication between Orange City Council (and its Contractors), the Environmental Representative (first 12 months of operation), the relevant council and community stakeholders on the operation of the Orange Raw Water Supply System. The document:

- identifies key stakeholders (including affected and adjoining landowners),
- outlines procedures for the regular distribution of information to stakeholders (including structure, scope, objectives and frequency of distribution),
- outlines the mechanisms in place to allow stakeholders to provide comment or feedback to Council and for Council to respond,
- outlines procedures for dispute resolution and complaint handling,
- shall be maintained and implemented throughout operation of the Orange raw water supply system.

1.2 Orange City Council’s Water and Sewer Team

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Phone</th>
<th>Email</th>
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<tbody>
<tr>
<td>Orange City Council</td>
<td>Director Technical Services</td>
<td>6393 8000</td>
<td><a href="mailto:council@orange.nsw.gov.au">council@orange.nsw.gov.au</a></td>
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<tr>
<td></td>
<td>Water and Sewerage Strategic Manager</td>
<td>6393 8000</td>
<td><a href="mailto:council@orange.nsw.gov.au">council@orange.nsw.gov.au</a></td>
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<td></td>
<td>Water Treatment Manager</td>
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<td>6393 8000</td>
<td><a href="mailto:council@orange.nsw.gov.au">council@orange.nsw.gov.au</a></td>
</tr>
</tbody>
</table>

Council’s 24 hour contact number is 1300 650 511.
2 Community Relations Function

2.1 Consultation roles

*Water and Sewer Team*

Orange City Council’s Water and Sewer team will lead the consultation activities during the operation of the Orange raw water supply system. Broadly, they include all internal and external communications and ongoing community consultation and stakeholder management.

Section five identifies each community communication activity and who is responsible for the delivery of each task.
3 Community Relations Plan

3.1 Community relations approach
During operation of the raw water supply system Orange City Council will be responsible for managing the community relations component. Section five of this community relations plan identifies Orange City Council’s deliverables.

3.2 Stakeholders
A stakeholder scan has been undertaken (Table 1). This is a reference list for other specific consultations that might involve these and/or other stakeholders.

Table 1 Project Scan

<table>
<thead>
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<th>Organisation / Title</th>
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<th>OEMP Approval</th>
<th>Compensatory Work</th>
<th>General Interest</th>
<th>Property access</th>
<th>Site Maintenance</th>
<th>Noise &amp; Vibration</th>
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<td>NSW Environment Protection Authority</td>
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</tr>
</tbody>
</table>
3.3 Level of public participation

Just as the stakeholders may change from project to project, so will their level of participation, and thus the communication tools to be used. On some projects the public’s role may be to provide feedback, in other cases, the public’s role may be collaborative - partnering with Orange City Council's Water and Sewer team to jointly address a problem or opportunity. Table 2 - Spectrum of public participation illustrates the different levels of participation.

Table 2. Spectrum of public participation

<table>
<thead>
<tr>
<th>Increasing level of public participation</th>
<th>Inform</th>
<th>Consult</th>
<th>Involve</th>
<th>Collaborate</th>
<th>Empower</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public participation goal</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>To provide the public with balanced and objective information to assist them in understanding the problem, alternatives, opportunities and/or solutions</td>
<td>To obtain public feedback on analysis, alternatives and/or decisions</td>
<td>To work directly with the public throughout the process to ensure that public concerns and aspirations are consistently understood and considered</td>
<td>To partner with the public in each aspect of the decision including the development of alternatives and the identification of the preferred solution</td>
<td>To place final decision-making in the hands of the public</td>
<td></td>
</tr>
<tr>
<td>Promise to the public</td>
<td>&quot;We will keep you informed&quot;</td>
<td>&quot;We will keep you informed, listen to and acknowledge concerns and aspirations, and provide feedback on how public input influenced the decision&quot;</td>
<td>&quot;We will work with you to ensure that your concerns and aspirations are directly reflected in the alternatives developed and provide feedback on how public input influenced the decision&quot;</td>
<td>&quot;We will look to you for advice and innovation in formulating solutions and incorporate your advice and recommendations into the decisions to the maximum extent possible&quot;</td>
<td>&quot;We will implement what you decide&quot;</td>
</tr>
<tr>
<td>Example technique</td>
<td>Fact sheet, Web site, Newsletter, Presentation</td>
<td>Public comment, Public meeting, Survey</td>
<td>Workshop, Deliberative polling</td>
<td>Citizen Advisory Committee, Working Group</td>
<td>Citizen jury, Ballot / election</td>
</tr>
</tbody>
</table>

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Orange Raw Water Supply OEMP: CCS
3.4 Key messages

- To operate a broad based water supply strategy for the next 50 years and beyond which focuses on ongoing water conservation, quality and demand management.
- To ensure the raw water system is operated in an environmentally responsible and cost effective manner.
- Council will provide information on the Orange raw water supply system to the community as it becomes available and will work with impacted stakeholders as required.

3.5 Communication tools

To ensure the effective implementation of this plan a variety of communication tools have been developed and utilised, some of which include:

- **Communication and management tools to share and record information including**: 24 hr Phone line, Email address, Orange City Council website, Reports and briefs, Advertisements, Media releases, signage and use of rates notices.

- **Activities to share information and bring people together including**: Council Meetings, presentations to school and groups, direct mail to stakeholders, tours.

3.5.1 The general community

The following communication activities will be implemented with the objective of engaging the broadest range of community members.

- **Orange City Council website** including use of dedicated pages for information.
- **Media releases** in the locally circulated newspapers prior to the commencement of operation. This will advise that relevant operational data will be available on Orange City Council Website (http://www.orange.nsw.gov.au/site/index.cfm?display=604698) or dedicated pages.
- **Telephone information** through the 24hr phone number 1300 650 511 or 02 6393 8000 or Email: council@orange.nsw.gov.au

3.5.2 Directly and indirectly affected stakeholders

- **Specific notifications** in advance of maintenance in a specific location.
- **Meetings/verbal contact** to discuss property access and maintenance.
- **Letters/emails** to affected stakeholders during maintenance.

3.5.3 Maintenance Communication

This is to ensure there is effective and timely information to anyone living or having to travel into or through the area during a maintenance period.

- **Signage** including variable message signs with warnings and timing as part of the Traffic Control Management Plan.
- **Letters** to provide on potential impacts (noise, vibration, dust).
- **Face to face meetings** with impacted stakeholders where there are impacts on them and/or their property.
- **Calling cards** to inform the community of the activities to take place in the immediate worksite area.
3.5.4 Communication with the Environmental Representative

- **Auditing tasks** – Environmental Representative will meet and discuss with Council compliance issues as required.

- **Advice Notes** – Environmental Representative will provide Council with an Advice Note in relation to any requests for a minor amendment. This Advice Note also goes to the Department of Planning & Infrastructure for approval.

- **Emails/Discussions** – relating to licences and approvals, to discuss minor amendments to the OEMP and any other issues. Examples of this may be: non-conformances, conflict resolution between the Council and the community, when required.

3.5.5 Communication with Water and Sewer Team

- **Weekly meetings between Council’s maintenance team** - to discuss the weeks to do list and allocate resources.

- **Toolbox talks** - to update staff and communicate specific messages about the day’s work, what it will entail and a risk assessment of that work.

- **Project staff induction** - to communicate policies and procedures and messages about the projects community communication strategy. Staff inductions are also done for safety and every staff person must be inducted into the work site prior to entering.

- **Impromptu Team meetings** – to address:
  - any issues that may arise at short notice or are unexpected;
  - complaints or other issues; and/or
  - non-conformance issues.
4 Customer Service & Response

4.1 Enquiries and Response Procedures

OCC has several policies directly related to customer service guarantee and response. OCC uses a software program Authority to record complaints or issues.

During the operations of the Orange raw water supply system a free call 24 hour 1300 650 511 number will be displayed at each fixed work site. All enquiries or complaints will be recorded in Council’s Authority program for management and reporting/auditing purposes. The process for managing enquiries and complaints will be:

- OCC receives an enquiry or complaint (written or verbal);
- The administration staff acknowledge the enquiry or complaint and log it into Authority Customer Request Management System (CRM);
- The necessary details and information are recorded;
- Essential information to collect is:
  a) Person’s Name;
  b) Date;
  c) Time;
  d) Contact phone or email if applicable;
  e) Preferred method of contact is to be noted;
  f) Type of complaint (i.e. – noise, dust, etc.);
  g) Appropriate staff person to deal with the complaint;
  h) Follow up and close off date for complaint.
- The appropriate OCC staff member will receive a printed report regarding the enquiry or complaint;
- OCC staff will distribute to an appropriate OCC staff person to follow up the enquiry or complaint;
- When OCC staff have followed up the enquiry or complaint they are to report back to the relevant OCC staff person with the outcome;
- When the enquiry or complaint has been addressed or completed the concerned OCC staff person will sign off in Authority and note the date;
- All enquiries and complaints are to be followed up within 48 hours of OCC receiving the enquiry or complaint and addressed as soon as possible.

4.2 Complaints Management System

As outlined above Authority is used as the complaints handling mechanism. Council’s “Customer Service Obligation” Policy ST021 and the Code of Conduct meet the obligations of AS 4269: Complaints Handling.

- All complaints received, including the means by which they were addressed and whether resolution was reached, with or without mediation will be maintained in the complaints register (Authority).
- Complaints Register reports will be included in the Monthly Extraction Reports. Only complaints related to the raw water supply system will be included.
- Where a resolution between Council and the community cannot be resolved the Environmental Representative will be brought in for mediation purposes.
- The complaints management system is ongoing as part of Council’s Customer Service operations.

Further to this, Council will ensure that the following information is readily available to the community for enquiries and complaints:
• 24 hour telephone number (1300 650 511) on which complaints enquiries and complaints can be registered.
• Postal address for written enquiries or complaints to be sent.
• Email address to which electronic enquiries or complaints may be transmitted.
• Mediation system for complaints unable to be resolved.
## 5 Community Engagement Schedule

### 5.1 Overview of community engagement activities

<table>
<thead>
<tr>
<th>Activity</th>
<th>Purpose of communication</th>
<th>Stakeholders</th>
<th>Responsibility</th>
<th>Timeframe</th>
<th>Outputs required</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General Activities to support Community Engagement</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stakeholder Engagement Plan</td>
<td>Inform/Consult</td>
<td>All</td>
<td>OCC</td>
<td>Ongoing</td>
<td>Stakeholder Engagement Plan is regularly reviewed and updated considering the stakeholders</td>
</tr>
<tr>
<td>Council briefings</td>
<td>Inform/Consult</td>
<td>Local Government Area (LGA)</td>
<td>OCC</td>
<td>As required</td>
<td>Reports to Council meetings</td>
</tr>
<tr>
<td>Meetings with Government agencies</td>
<td>Inform/Consult</td>
<td>Government</td>
<td>OCC</td>
<td>As required for ongoing compliance</td>
<td>Approval of any OEMP variations by relevant government agencies</td>
</tr>
<tr>
<td><strong>Communications targeting the general community</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Orange City Council Website</td>
<td>Inform</td>
<td>All stakeholders</td>
<td>OCC</td>
<td>On the commencement of the OEMP and as documents are progressively made available.</td>
<td>Information including:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Macquarie River to Orange Pipeline project documents including:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>– Major Projects Application MP10_0235;</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td>– Macquarie River to Orange Pipeline Project Environmental Assessment (GHD, August 2012);</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>– Macquarie River to Orange Pipeline Project Preferred Project Report (GHD, February 2012);</td>
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<td></td>
<td></td>
<td>– Macquarie River to Orange Pipeline Project – Clarification of Calculations of Permanent and Temporary Vegetation Impacts (letter dated 12 March 2013 from Orange City Council); and</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>– The Project Approval (dated 18 June 2013);</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>The following statutory approvals and licences:</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>– WAL 36161</td>
</tr>
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<td></td>
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<td></td>
<td>– WAL 33891</td>
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<td></td>
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<td>– WAL 29148</td>
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<td>– WAL 36374</td>
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<td></td>
<td>– WAL 30283</td>
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<tr>
<td></td>
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<td></td>
<td></td>
<td>Links to the DoI Water real time data website for those sites that have real time data reporting;</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>The current version of this OEMP;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>The current operating rules;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>The Monthly Extraction Reports (refer to HMP sub-plan in this OEMP);</td>
</tr>
<tr>
<td>Activity</td>
<td>Purpose of communication</td>
<td>Stakeholders</td>
<td>Responsibility</td>
<td>Timeframe</td>
<td>Outputs required</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>--------------------------</td>
<td>------------------------------------------------------------------------------</td>
<td>------------------------------------------</td>
<td>---------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Stakeholder Reference Group</td>
<td>Inform</td>
<td>Groups to be targeted:</td>
<td>OCC</td>
<td>On commencement</td>
<td>Letters to SRG and advice on where and how to access information</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Summer Hill Creek Care Group;</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>• Ophir Reserve Trust;</td>
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<tr>
<td></td>
<td></td>
<td>• Mirrabooka Farms;</td>
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<tr>
<td></td>
<td></td>
<td>• Landowner representatives in the Ploughmans Creek valley; and</td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td>• Orange Trout Acclimatisation Society</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Media releases in locally circulated</td>
<td>Inform</td>
<td>All stakeholders</td>
<td>OCC Manager Corporate and</td>
<td>Prior to commencement of operation and/or as required</td>
<td>Media releases advising where relevant operational data will be available on Orange City Council Website</td>
</tr>
<tr>
<td>newspapers</td>
<td></td>
<td></td>
<td>Community Relations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Telephone and email contacts</td>
<td>Inform</td>
<td>All stakeholders</td>
<td>OCC</td>
<td>Ongoing</td>
<td>Telephone information at 02 6393 8000 or 24hr phone number 1300 650 511 or Email: <a href="mailto:council@orange.nsw.gov.au">council@orange.nsw.gov.au</a></td>
</tr>
<tr>
<td>Directly affected stakeholders</td>
<td></td>
<td>All potentially directly affected properties and stakeholders</td>
<td>OCC</td>
<td>As required</td>
<td>Planned maintenance work – at least 2 days notification Emergency works – as soon as practicable</td>
</tr>
<tr>
<td>Notification about potential impacts on</td>
<td>Inform</td>
<td>All potentially directly affected properties and stakeholders</td>
<td>OCC</td>
<td>As required</td>
<td>Where possible potentially impacted stakeholders are aware of likely disruptions.</td>
</tr>
<tr>
<td>stakeholders and properties.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Notices and advertisement to alert of</td>
<td>Inform</td>
<td>All potentially directly affected properties and stakeholders</td>
<td>OCC</td>
<td>As required</td>
<td>Communication to stakeholders about potential maintenance impacts</td>
</tr>
<tr>
<td>specific impacts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maintenance Communication</td>
<td></td>
<td>All potentially directly and indirectly affected properties and stakeholders</td>
<td>OCC</td>
<td>As required</td>
<td>Where possible potentially impacted stakeholders are aware of likely disruptions.</td>
</tr>
<tr>
<td>Signage in particular in relation to traffic</td>
<td>Inform</td>
<td>All potentially directly and indirectly affected properties and stakeholders</td>
<td>OCC</td>
<td>As required</td>
<td></td>
</tr>
<tr>
<td>disruptions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Letters / emails to update of upcoming</td>
<td>Inform</td>
<td>All potentially directly and indirectly affected properties and stakeholders</td>
<td>OCC</td>
<td>As required</td>
<td>Communication to stakeholders about potential maintenance impacts</td>
</tr>
<tr>
<td>maintenance impacts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calling cards</td>
<td>Inform</td>
<td>Directly affected properties</td>
<td>OCC</td>
<td>Immediately prior to any likely impact</td>
<td>Timely notification of any impacts</td>
</tr>
<tr>
<td>Communication with Water and Sewer Team</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Toolbox talks</td>
<td>Inform/Consult</td>
<td>Team to inform their communication with stakeholders</td>
<td>OCC</td>
<td>Ongoing</td>
<td>Toolbox records completed</td>
</tr>
<tr>
<td>Staff/Contractor inductions</td>
<td>Inform/Consult</td>
<td>Team</td>
<td>OCC</td>
<td>Ongoing</td>
<td>All staff are inducted and community engagement messages are included with the induction Also done for WH&amp;S compliance</td>
</tr>
<tr>
<td>Impromptu team/contractor meetings</td>
<td>Inform/Consult</td>
<td>Internal and Contractor</td>
<td>OCC</td>
<td>Ongoing</td>
<td>Issues are discussed and resolved Non-conformances are dealt with Complaints or issues can be raised and addressed Any other issues of importance can be discussed</td>
</tr>
<tr>
<td>Activity</td>
<td>Purpose of communication</td>
<td>Stakeholders</td>
<td>Responsibility</td>
<td>Timeframe</td>
<td>Outputs required</td>
</tr>
<tr>
<td>-------------------------</td>
<td>--------------------------</td>
<td>------------------</td>
<td>----------------</td>
<td>----------------------------------</td>
<td>-------------------------------------------------------</td>
</tr>
<tr>
<td>Auditing Tasks</td>
<td>Compliance</td>
<td>Internal</td>
<td>OCC and ER</td>
<td>As required by the CoA</td>
<td>Audit report</td>
</tr>
<tr>
<td>Advice Notes</td>
<td>Approval of minor amendments</td>
<td>Internal/External</td>
<td>ER and DoP</td>
<td>As requested</td>
<td>Approval of minor amendment</td>
</tr>
<tr>
<td>Emails/Discussions</td>
<td>Inform and consult</td>
<td>Internal</td>
<td>OCC and ER</td>
<td>Ongoing</td>
<td>Clarification of issues and achieving outcomes.</td>
</tr>
</tbody>
</table>
## 5.2 Mandatory communication

<table>
<thead>
<tr>
<th>Mandatory communication</th>
<th>Completed by</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monthly Extraction Report</td>
<td>Two working weeks following month end. Published on Orange City Council's website.</td>
</tr>
<tr>
<td>Annual Review</td>
<td>Completed by 1 September each year. Published on Orange City Council's website.</td>
</tr>
<tr>
<td>Access to information</td>
<td>Commencement of operations</td>
</tr>
</tbody>
</table>

## 5.3 Monitoring and evaluation

<table>
<thead>
<tr>
<th>Objective</th>
<th>Method of evaluation</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual Review</td>
<td>Review complaints relating to communications</td>
<td>Update Stakeholder Engagement Plan as required</td>
</tr>
</tbody>
</table>
Attachment I

ADAPTIVE MANAGEMENT STRATEGY
<table>
<thead>
<tr>
<th>Version</th>
<th>Revision Date</th>
<th>Details</th>
<th>Authorised</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Name/Position</td>
</tr>
<tr>
<td>1.0</td>
<td>29/02/16</td>
<td>Draft for review</td>
<td>M Haege/Geolyse</td>
</tr>
<tr>
<td>2.0</td>
<td>08/04/16</td>
<td>Draft for review</td>
<td>M Haege/Geolyse</td>
</tr>
<tr>
<td>3.0</td>
<td>09/05/16</td>
<td>Issue for implementation</td>
<td>M Haege/Geolyse</td>
</tr>
<tr>
<td>4.0</td>
<td>04/07/16</td>
<td>Edits in response to comments from DP&amp;E received 28/06/16</td>
<td>M Haege/Geolyse</td>
</tr>
<tr>
<td>5.0</td>
<td>15/06/18</td>
<td>Updated to address actions identified in the Internal Compliance Audit</td>
<td>M Haege/Geolyse</td>
</tr>
</tbody>
</table>
## ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AEMP</td>
<td>Aquatic Environmental Monitoring Program</td>
</tr>
<tr>
<td>AHD</td>
<td>Australian height datum</td>
</tr>
<tr>
<td>AMS</td>
<td>Adaptive management strategy</td>
</tr>
<tr>
<td>ANZECC</td>
<td>Australian and New Zealand Environment and Conservation Council</td>
</tr>
<tr>
<td>ARMCANZ</td>
<td>Agriculture and Resource Management Council of Australia and New Zealand</td>
</tr>
<tr>
<td>BSCSHS</td>
<td>Blackmans Swamp Creek stormwater harvesting scheme</td>
</tr>
<tr>
<td>CCS</td>
<td>Community communication strategy</td>
</tr>
<tr>
<td>CTF</td>
<td>Cease to flow</td>
</tr>
<tr>
<td>CoA</td>
<td>Condition of approval</td>
</tr>
<tr>
<td>DP&amp;E</td>
<td>Department of Planning and Environment</td>
</tr>
<tr>
<td>DoI</td>
<td>Department of Industry</td>
</tr>
<tr>
<td>DPI</td>
<td>Department of Primary Industries</td>
</tr>
<tr>
<td>DPI Water</td>
<td>Department of Primary Industries Water</td>
</tr>
<tr>
<td>DST</td>
<td>Decision Support Tool</td>
</tr>
<tr>
<td>EA</td>
<td>Environmental Assessment</td>
</tr>
<tr>
<td>EP&amp;A Act</td>
<td>NSW Environmental Planning and Assessment Act 1979</td>
</tr>
<tr>
<td>GL</td>
<td>Gigalitre (1,000 megalitres)</td>
</tr>
<tr>
<td>GMP</td>
<td>Groundwater monitoring program</td>
</tr>
<tr>
<td>ha</td>
<td>Hectares</td>
</tr>
<tr>
<td>HMP</td>
<td>Hydrology monitoring program</td>
</tr>
<tr>
<td>IMP</td>
<td>Inspection and maintenance plan</td>
</tr>
<tr>
<td>kL</td>
<td>Kilolitre (1,000 litres)</td>
</tr>
<tr>
<td>km</td>
<td>Kilometre (1,000 metres)</td>
</tr>
<tr>
<td>kWhr</td>
<td>Kilowatt hour</td>
</tr>
<tr>
<td>L</td>
<td>Litre (1,000 millilitres)</td>
</tr>
<tr>
<td>LGA</td>
<td>Local Government Area</td>
</tr>
<tr>
<td>L/s</td>
<td>Litres per second</td>
</tr>
<tr>
<td>m³</td>
<td>Cubic metre (1,000 litres)</td>
</tr>
<tr>
<td>m³/hr</td>
<td>Cubic metres per hour</td>
</tr>
<tr>
<td>m³/s</td>
<td>Cubic metres per second</td>
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<td>Scour water management plan</td>
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<td>Water sharing plan</td>
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Background

1.1 INTRODUCTION

This Adaptive Management Strategy (AMS) forms part of the Orange Raw Water Supply System Operation Environmental Management Plan (OEMP).

It has been developed to set out the procedures to manage the operation of the Orange City Council (OCC) raw water supply system in response to monitoring undertaken for the Aquatic Environment Monitoring Program (AEMP – Attachment D), the Hydrology Monitoring Program (HMP – Attachment E) and the operating rules defined by the Decision Support Tool (DST – Attachment C).

1.2 ADAPTIVE MANAGEMENT STRATEGY

Specific approval requirements for the AMS are provided below.

Project Approval for the Macquarie River to Orange pipeline

Condition D3 of the Project Approval outlines the requirement for the AMS as follows:

D3. The Adaptive Management Strategy referred to in condition D2 [the requirement to prepare and implement an OEMP] is to set out the procedures to manage the operation of the project in response to monitoring results obtained in condition B1 [AEMP] and the operating rules defined in condition B4 [DST]. The AMS is to:

(a) Incorporate a decision making framework that sets out specific actions that may be required to be implemented in order to reduce impacts identified as a result of the monitoring required in condition B1;

(b) Identify matters to be addressed in annual reports required under condition C5 in relation to the outcomes of monitoring, the application of the decision making framework, the mitigation measures identified, progress with the implementation of such measures, and their success.

(c) Review mechanisms to assess the effectiveness of the Adaptive Management Strategy and propose changes to manage impacts of the environment.

The report referred to under condition C5 [Annual Review] shall be submitted to the DPI, OEH and the Department identified in condition B1. The Director General may, at the request of the Proponent vary the reporting requirement or period by notice in writing to the Proponent. The Proponent may request the Director General to consider a variation to the reporting requirements at any time.
The Proponent is required to implement reasonable and feasible mitigation measures as identified under D3(a) where the need for further action is identified through the respective Monitoring Program, or as otherwise agreed with the Director General.

1.3 WHAT IS ADAPTIVE MANAGEMENT?

1.3.1 AMS PROCESS

Adaptive management is a systematic approach for improving management by predicting the outcomes of management activities and then strategically monitoring the actual outcomes to gather information to improve future management. Adaptive management promotes flexible decision-making that can be adjusted as outcomes from management actions and other events become better understood.

In terms of process, adaptive management requires stated management objectives to guide decisions about what actions to take, assumptions about expected outcomes to compare against actual outcomes, monitoring to provide feedback about the system and actions, learning from the system as actions are taken to manage it, and incorporating what is learned into future actions. This process is reflected in Figure 1.

Figure 1: Adaptive management process
In summary an adaptive management approach:

- allows managers to maintain flexibility in their decisions, knowing that uncertainties exist;
- provides managers the latitude to change direction;
- improves understanding of ecological systems to achieve management objectives; and
- ensures actions are taken to improve progress towards desired outcomes.

1.3.2 ADAPTIVE MANAGEMENT FRAMEWORK

The framework of the AMS for the Orange raw water supply OEMP is shown in Figure 2. This is based around a practical application of the adaptive management process. This AMS is presented in accordance with this framework as follows:

- Setting the scope of the AMS;
- Understanding risk and setting performance objectives;
- Management planning and implementing actions;
- Monitoring and data collection;
- Reporting, evaluation and review;
- Actions for amending management plans; and
- Reviewing the AMS.
Figure 2: AMS Framework
Adaptive Management Strategy

2.1 SCOPE

In accordance with CoA D3, the AMS applies to:

- The Aquatic Environment Monitoring Program (CoA B1);
- The Decision Support Tool (CoA B3);
- The operating rules defined in CoA B4; and
- Annual Review (CoA C5).

2.2 PERFORMANCE OBJECTIVES

2.2.1 AEMP

The specific objectives of the AEMP are:

1. To identify any changes in hydrology and aquatic ecology (including fish and aquatic and riparian vegetation) in the Macquarie River as a result of the operation of the Macquarie River to Orange pipeline project.
2. To determine the efficiency of the Macquarie River to Orange pipeline offtake design and screens to limit impingement, entrainment and minimise impacts to eggs, larvae or changes to recruitment of threatened aquatic species.
3. To identify any changes in hydrology and aquatic ecology (including fish and aquatic and riparian vegetation) in Summer Hill Creek as a result of increased flow volumes and spills from Suma Park Dam.
4. To determine if the environmental flow releases maintain or enhance the key values of water quality, aquatic biodiversity, river health and general ecological condition of Summer Hill Creek.
5. To identify if environmental flow Rule 2 maintains 4% riffle habitat at four (4) riffles on Summer Hill Creek between the confluence of Emu Swamp Creek and the confluence of Blackmans Swamp Creek.

2.2.2 DST

The overall objective of the DST is to manage and optimise the use of the various raw water supplies in the system based on the “Five C’s”:

- Critical level – operating the system to ensure that:
  - the combined storage is at or above a defined critical level at the end of each water year; and/or

<table>
<thead>
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<th>Adaptive Management Strategy</th>
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<tbody>
<tr>
<td>Page 10 of 16</td>
</tr>
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<tr>
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restriction regimes are consistent with the frequency and duration of restriction components of the 5/10/10 secure yield rule.

- **Climate** – adopting operating rules based on expected climatic conditions.
- **Controlling spill** – minimising spill from Suma Park Dam by operating the system cognisant of forecast climatic conditions and likely catchment inflow.
- **Conditions** – ensuring all raw water supplies are operated in accordance with approval conditions.
- **Cost** – minimising the cost of the raw water supply by adopting operating rules that use the lowest cost water first.

### 2.2.3 PROJECT APPROVAL CONDITION B4

Project Approval CoA B4 and associated CoA B6 require:

**B4** The Project is to be operated consistent with:

(a) The Orange Water Supply Decision Support Tool in condition B3;

(b) The operating rules where:

i. Pumping is only to occur when the instantaneous river flow immediately downstream of the pumps will exceed the 80th percentile flow (the note below specifies how the 80th percentile flow rate is determined); and

ii. No more than 12 ML is to be extracted from the Macquarie river at Cobbs Hut Hole over any 24 hour period; and

iii. The instantaneous rate of extraction is not to exceed 15.2 ML/day; and

iv. The water level in Suma Park Dam is less than 90 percent full; and

v. A cease to pump trigger applies, corresponding to a flow in the Macquarie river at Gauging Station 421192 (upstream of the pumps) of 15.2 ML/day above the 80th percentile flow (e.g. 92 +15.2 =~108 ML/day); and

(c) The river flow margin of error for Gauging Station 421192 determined in accordance with condition B6.

**B6** River flow gaugings shall be completed for Gauging Station 421192 in order to improve and verify the streamflow rating for the Macquarie River at Gauging Station 421192, in consultation with DPI (NOW).

The operating rules shall adopt a flow trigger that includes a margin of error of the flow rating determined in consultation with DPI (NOW) until such time as DPI (NOW) is satisfied that the flow rating correlates with flows in the Macquarie River at Gauging Station 421192.
2.3 PLANNING AND IMPLEMENTATION

The Orange raw water supply OEMP has been prepared cognisant of the performance objectives outlined in Section 2.2.

Impact assessment undertaken during the project investigation and approval stage for the Macquarie River to Orange pipeline, Suma Park Dam upgrade and stormwater harvesting schemes concluded that when these schemes are operated in accordance with approved conditions, there would be no significant detrimental environmental impact.

The OEMP defines actions to ensure the schemes are operated in accordance with approvals and licenses. Relevant Council staff responsible for the actions are identified.

Specific sub-plans of the OEMP that outline management actions and monitoring for the AMS are the:

- Aquatic Environment Monitoring Program (Attachment D);
- Decision Support Tool (Attachment C); and
- Hydrology Monitoring Program (Attachment E).

These sub-plans may be modified through the implementation of this AMS.

2.4 MONITORING AND DATA COLLECTION

Monitoring and data collection to be undertaken to inform the AMS are outlined in the:

- Aquatic Environment Monitoring Program (Attachment D);
- Decision Support Tool (Attachment C); and
- Hydrology Monitoring Program (Attachment E).

Monitoring programs may be modified through the implementation of this AMS.

2.5 REPORTING, EVALUATION AND REVIEW

The final steps in the adaptive management process are to evaluate and review management practices in light of the knowledge gained through monitoring. The updating and review process may simply increase the confidence in the suitability of existing management plans. However, this process may also uncover new insights about how management actions are affecting the achievement of management objectives.

Annual reporting will be completed in accordance with each sub-plan. Evaluation of the monitoring results will be undertaken against the objectives outlined in Section 2.2 for each sub-plan. A consolidated Annual Review will be completed in accordance with Section 4.4 – OEMP Reporting. Results of the Annual Review and any audit reports that may have been completed in the operating year will inform the adaptive management process.
Each sub-plan annual report will include a summary of all monitoring results and, importantly for the AMS, will:

- Identify any non-compliance over the last year, and describe what actions were (or are being) taken to ensure compliance;
- Identify any trends in the monitoring data over the life of the development;
- Identify any discrepancies between the predicted and actual impacts of the development, and analyse the potential cause of any significant discrepancies; and
- Identify measures that could be implemented to improve the environmental performance of the development and justification for any decision to not implement those measures.

These will be summarised in the Annual Review.

The Annual Review will form the basis for seeking approval for any changes to management plans.

2.6 AMENDING MANAGEMENT PLANS

A process for amending management plans in the event of identified negative changes will be applied. This will be based on a graded hierarchy of responses to ensure the causes of any problems are understood and changes to management plans are applied to reverse the situation.

The amendment process will include:

- internal review by relevant OCC staff to analyse the issue;
- increased monitoring and/or technical analysis to help determine the cause of the problem;
- engaging additional expert analysis if required;
- identification and evaluation of possible solutions;
- recommending changes to management plans and seeking approval for these changes;
- implementation of revised management actions following approval;
- further monitoring, evaluation and review to determine if the problem has been addressed; and
- incorporation of the outcomes of the process in the next Annual Review (Section 4.4 – OEMP Reporting).

The Water and Sewerage Strategic Manager shall be responsible for ensuring that any corrective actions are implemented and updates to the OEMP made as required.
AMS Actions

3.1 OPERATING YEAR

The operating year is defined as 1 July to 30 June.

This is to be consistent with the water year as used by the NSW Department of Industry – Water (DoI Water) for reporting under the Water Management Act 2000.

3.2 AMS IMPLEMENTATION

When: Continual implementation and/or triggered in response to:

• The Annual Review (Section 4.4 – OEMP Reporting); or
• An incident report (Section 3.2.18 – Environmental Incident Management); or
• An audit (Section 4.3 – Environmental Auditing and Compliance).

Actions:

1. The Water and Sewerage Strategic Manager shall ensure all routine monitoring and data collection is undertaken in accordance with the OEMP. A calendar is provided in Attachment B of the OEMP which lists all routine actions.

2. The Water and Sewerage Strategic Manager shall ensure all annual reports for sub-plans are completed in time to allow the Annual Review to be submitted by 1 September each year. Refer to Section 4.4 – OEMP Reporting and relevant sub-plans (AEMP, DST and HMP).

3. The Water and Sewerage Strategic Manager shall ensure each sub-plan annual report identifies:

• any non-compliance over the last year, and describe what actions were (or are being) taken to ensure compliance;
• any trends in the monitoring data over the life of the development;
• any discrepancies between the predicted and actual impacts of the development, and presents analysis of the potential cause of any significant discrepancies; and
• measures that could be implemented to improve the environmental performance of the development and justification for any decision to not implement those measures.
4 If a sub-plan annual report recommends a change to one of the management plans, the **Water and Sewerage Strategic Manager** shall consider the information presented and either:

1. approve the proposed changes and seek approval from the Department of Planning and Environment for changes to the OEMP (go to Action 6); or

2. initiate further investigations (go to Action 5).

5 If further investigations are initiated at Action 4, the **Water and Sewerage Strategic Manager** shall implement:

- an internal review by relevant OCC staff to analyse the issue; or
- increased monitoring to help determine the cause of the problem, if deemed appropriate; or
- further technical analysis of the data supported by additional expert analysis if required.

The outcome from these further investigations will be confirmation (or otherwise) of the issue and identification and evaluation of possible solutions and/or corrective actions if required.

6 The **Water and Sewerage Strategic Manager** shall ensure that any corrective actions identified from Action 5 are implemented and updates to the OEMP made as required.

Any changes to management plans in the OEMP will be subject to approval from the Department of Planning and Environment (Action 7).

7 Changes to management plans in the OEMP will be endorsed through consultation with the relevant Government Agency as follows:

- AEMP – Department of Industry – Water (DoI Water) and DPI Fisheries
- DST – DoI Water

The endorsed changes will be submitted to the Department of Planning and Environment for approval.

8 The **Water and Sewerage Strategic Manager** shall disseminate and implement approved OEMP management plans.

**Who:** The **Water and Sewerage Strategic Manager** shall be responsible for undertaking Actions 1 to 8.

**Records:** A record of the implementation of the AMS will be provided in the next scheduled Annual Review.
3.3 AMS REVIEW

3.3.1 REVISION TO STRATEGIES, PLANS AND PROGRAMS

CoA C6 requires that OCC shall review, and if necessary revise, strategies, plans and programs included in the OEMP to the satisfaction of the Director-General within 3 months of:

a) the Annual Review (Section 4.4 – OEMP Reporting);
b) any Incident Report (Section 3.2.18 – Environmental Incident Management);
c) an Audit Report (Section 4.3 – Environmental Auditing and Compliance); or
d) any modification to the conditions of the Project Approval,

This is to ensure that plans and programs are updated on a regular basis, and incorporate any recommended measures to improve environmental performance.

3.3.2 DOCUMENT CONTROL

The following will be classed as ‘major’ revisions:

- Changes to processes;
- Changes to monitoring programs, either timing or parameters monitored;
- Changes made in response to an incident; and/or
- Changes requested by a relevant Government agency.

Major revisions will be identified by the whole number in the version number (i.e. 1.0, 2.0, 3.0...) and will be reviewed, approved and re-circulated as necessary.

The following will be classed as ‘minor’ revisions:

- Minor typing and grammar corrections;
- Changes to position titles; and
- Updates to recording forms to suit changes in operations.

Minor revisions will be identified by the decimal point in the version number (i.e. 1.1, 2.2, 3.3...) and will not require review and approval prior to re-circulation.

Major and minor revisions will be listed in the Revision History at the front of this document.
Attachment J

GROUNDWATER MONITORING PROGRAM
# Revision History

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ABBREVIATIONS

AEMP
Aquatic Environmental Monitoring Program

AHD
Australian height datum

AMS
Adaptive management strategy

ANZECC
Australian and New Zealand Environment and Conservation Council

ARMCANZ
Agriculture and Resource Management Council of Australia and New Zealand

BSCSHS
Blackmans Swamp Creek stormwater harvesting scheme

CCS
Community communication strategy

CTF
Cease to flow

CoA
Condition of approval

DEE
Department of Environment and Energy

DST
Decision Support Tool

Dol
Department of Industry

DPI
Department of Primary Industries

DPI Water
Department of Primary Industries Water

DSEWPC
Department of Sustainability, Environment, Water, Population and Communities (now DEE)

DEE
Department of Environment and Energy

EA
Environmental Assessment

EP&A Act
NSW Environmental Planning and Assessment Act 1979

GL
Gigalitre (1,000 megalitres)

GMP
Groundwater monitoring program

ha
Hectares

HMP
Hydrology monitoring program

IMP
Inspection and maintenance plan

kL
Kilolitre (1,000 litres)

km
Kilometre (1,000 metres)

kWhr
Kilowatt hour

L
Litre (1,000 millilitres)

LGA
Local Government Area

L/s
Litres per second

m³
Cubic metre (1,000 litres)

m³/hr
Cubic metres per hour

m³/s
Cubic metres per second

mg/L
Milligrams per litre

mL
Millilitre

ML
Megalitre (1 million litres or 1,000 kilolitres)

ML/day
Megalitres per day

m
Metre
mm  Millimetre
MOP  Macquarie River to Orange pipeline
OCC  Orange City Council
OEMP  Operation Environmental Management Plan
PA  Project approval
PCSHS  Ploughmans Creek stormwater harvesting scheme
ScWMP  Scour water management plan
SEP  Stakeholder engagement plan
STP  Sewage treatment plant
µg/L  Micrograms per litre
µS/cm  Micro Siemens per centimetre
WAL  Water access licence
WFP  Water filtration plant
WSP  Water sharing plan
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Background

1.1 INTRODUCTION

This Groundwater Monitoring Program (GMP) forms part of the Orange Raw Water Supply Operational Environmental Monitoring Plan (OEMP).

It has been developed to outline operational groundwater monitoring requirements as provided in the Borehole Impact Management Plans (BIMP) for the Clifton Grove bores (Shearing Shed Bore and Bore No. 5) and the Showground/Margaret Street Depot bores.

1.2 GROUNDWATER MONITORING PROGRAM

Specific requirements for the GMP are outlined in:

- Borehole Impact Management Plan (BIMP) Showground Bore and Margaret Street Depot Bore (Hydroilex, May 2011); and
- Borehole Impact Management Plan (BIMP) Clifton Grove Bore 1A (Shearing Shed) and Bore No. 5 (Riding for the Disabled) (Hydroilex, 8 November 2011).

Monitoring and reporting requirements are also specified in the water access licences (WALs) and bore licences.
Licence Data

2.1 WATER ACCESS LICENCES

OCC holds the Water Access Licences (WALs) for groundwater listed in Table 2.1.

Table 2.1 – Water Access Licence (WAL) summary

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<td>Clifton Grove Bores</td>
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<td></td>
<td></td>
<td>(Shearing Shed and Bore No. 5)</td>
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<td>29148</td>
<td>80BL245074</td>
<td>Groundwater</td>
<td>80CA715359</td>
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<td>80BL245947</td>
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2.2 LICENSED EXTRACTION LIMITS

2.2.1 WAL 30283 – CLIFTON GROVE BORES – SHEARING SHED AND BORE NO. 5

Share component is 182 ML.

The maximum volume of water that may be taken under this WAL in any water year must not exceed a volume equal to:

(A) the sum of water allocations accrued to the water allocation account for this licence from available water determinations in that year; plus

(B) the water allocations carried over from the water year prior to that water year; plus

(C) the net amount of any water allocations assigned to or from the water allocation account for this licence under section 71T of the Water Management Act 2000; plus

(D) any water allocations re-credited to the water allocation account for this licence in accordance with section 76 of the Water Management Act 2000 in that water year.

The maximum water allocation that may be carried over in the water allocation account for this WAL from one water year to the next is 10% of the WAL share component.

2.2.2 WAL 29148 – SHOWGROUND/MARGARET STREET DEPOT BORES

Share component is 280 ML.
The maximum volume of water that may be taken under this WAL in any water year must not exceed a volume equal to:

(A) the sum of water allocations accrued to the water allocation account for this licence from available water determinations in that year; plus

(B) the net amount of any water allocations assigned to or from the water allocation account for this access licence under section 71T of the Water Management Act 2000; plus

(C) any water allocations re-credited to the water allocation account for this licence in accordance with section 76 of the Water Management Act 2000.

Water allocations remaining in the water allocation account for WAL29148 cannot be carried over from one water year to the next.
Groundwater Monitoring Program

3.1 OPERATING YEAR

The operating year is defined as 1 July to 30 June.

This is to be consistent with the water year as used by the NSW Department of Industry – Water (DoI Water) for reporting under the Water Management Act 2000.

3.2 GROUNDWATER MONITORING

3.2.1 MONITORING NETWORK

There are four (4) existing production bores to be monitored, including the following:

- Clifton Grove Bores:
  - Shearing Shed Bore
  - Bore No. 5
- Showground Bore
- Margaret Street Depot Bore

A map of the groundwater monitoring network is provided in Figure 1.
Figure 1: Groundwater Monitoring Network

Legend
- Bores
  - Bores
- Watercourses
  - Blackmans Swamp Creek
  - Summer Hill Creek System
3.2.2 GROUNDWATER LEVEL MONITORING

When: Continuous during groundwater pumping

Actions: 1 Groundwater bores shall be equipped with level sensors and loggers that record groundwater levels.

2 Program automated water level loggers to record measurements at one (1) measurement every four (4) hours.

3 Water level sensors and data loggers to be maintained to ensure they are operating effectively.

4 Data shall be stored in Council’s data management system.

5 Level triggers are to be set at each groundwater bore based on the levels nominated in Table 3.1.

6 The Water Treatment Supervisor shall advise the Water Compliance Coordinator if the monitored water level in a production bore during any production pumping period falls below a trigger level defined in Table 3.2.

7 If required by a notification of a trigger level, the Water Compliance Coordinator will implement actions as identified in Table 3.2.

8 Notification of a trigger level shall be recorded as an Incident in accordance with Section 3.2.18 – Environmental Incident Management.

Who: The Water Treatment Supervisor is responsible for Actions 1 to 5.

The Water Compliance Coordinator is responsible for Actions 6 to 8.

Records: Database records

Incident Report
3.2.2.1 Groundwater Trigger Levels and Actions

There are three (3) triggers for production bore water levels (refer – Table 3.1).

Table 3.1 – Production Bore Level Triggers

<table>
<thead>
<tr>
<th>Bore</th>
<th>Trigger Level 1</th>
<th>Trigger Level 2</th>
<th>Trigger Level 3</th>
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<tr>
<td>Shearing Shed Bore</td>
<td>&lt;35m</td>
<td>&lt;44m</td>
<td>&lt;54m</td>
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<tr>
<td>Bore No. 5</td>
<td>&lt;10m</td>
<td>&lt;15m</td>
<td>&lt;28m</td>
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<td>Showground Bore</td>
<td>&lt;30m</td>
<td>&lt;32m</td>
<td>&lt;35m</td>
</tr>
<tr>
<td>Margaret Street Depot Bore</td>
<td>&lt;32m</td>
<td>&lt;36m</td>
<td>&lt;40m</td>
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</table>

1. Monitored water level in the production bores during any production pumping period falls below trigger levels (below ground level) specified.

Table 3.2 – Production Bore Level Trigger Actions

<table>
<thead>
<tr>
<th>Trigger Level</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Levels</td>
<td>Record date of impact in water level database.</td>
</tr>
</tbody>
</table>
| 1             | - Notify the hydrogeological consultant by email or phone within 7 days. This trigger level (if reached) should not constitute a formal notification.  
- Provide relevant data to the hydrogeological consultant for assessment |
| 2             | - Notify the Senior Hydrogeologist, Dol Water and the hydrogeological consultant by email or letter within 7 days.  
- Provide all relevant data to the hydrogeological consultant for assessment.  
- Consider adjusting the extraction rate of the production bore to a flow where the trigger water level is not exceeded,  
  OR  
- Consider adjusting the pumping period where the trigger water level is not exceeded,  
  OR  
- Consider adjusting both the extraction rate and the pumping period where the trigger water level is not exceeded. |
| STOP PUMPING  | - Record date of impact in water level database.  
- Notify the Senior Hydrogeologist, Dol Water and the hydrogeological consultant by email or letter within 5 days.  
- Assess all monitoring and production data.  
- Make conclusions and provide recommendations.  
- Meet with the Senior Hydrogeologist, Dol Water to discuss results, cause/s of the declining water level and a contingency plan to go forward. |
3.2.3 GROUNDWATER QUALITY MONITORING

3.2.3.1 Monitoring Sites

Groundwater quality will be monitored at three (3) existing production bores:

- Clifton Grove Bores:
  - Shearing Shed Bore
  - Bore No. 5
- Showground Bore

The Margaret Street Depot Bore will only be monitored for groundwater levels.

A map of the groundwater monitoring network is provided in Figure 1.

3.2.3.2 Monitoring Parameters

Groundwater shall be monitored for:

- pH
- Electrical conductivity (µS/cm)
- Total dissolved solids (mg/L)
- Turbidity (NTU)
- Faecal coliforms (cfu/100mL)
- Aluminium (mg/L)
- Fluoride (mg/L)
- Iron (mg/L)
- Manganese (mg/L)
- Arsenic (mg/L)
- Pesticides (µg/L)
- Sodium (mg/L)
- Selenium (mg/L)
- Sulphate (mg/L)
- Hardness (mg/L)
- Cyanide (mg/L)
- Nitrate (mg/L)
3.2.3.3 Monitoring Frequency

Groundwater quality sampling shall be undertaken quarterly: August, November, February and May.

The monitoring program shall be reviewed after two years.

3.2.3.4 Groundwater Quality Triggers

Groundwater quality triggers will not be set until at least two years of data is obtained.

A preliminary approach, pending acquisition of long-term data, is a significant change in water quality. A significant change is defined as:

- A pH less than 6.0.
- An increasing trend in EC and TDS values.

3.2.3.5 Actions

**Immediate Actions**

Continue to monitor and assess bore water quality data, establish trends and correlate with water extraction activities and climatic data (rainfall) to determine a causal links (if any). Apply statistical analysis to assess trends if required.

**Follow-up Actions**

If evolving geochemical anomalies are detected in groundwater sampled from monitoring bores and an impact on the aquifer system is demonstrated, continue to monitor and contact a suitably qualified groundwater professional to assess the results and advise suitable action.

3.2.4 DATA COLLECTION AND MANAGEMENT

3.2.4.1 WAL Records

The WALs require records of the following information for groundwater bores:

*Condition MW0633-00001*

The licence holder must record the following in a logbook:

(i) each date and period of time during which water is taken under this licence;

(ii) the volume of water taken on that date;

(iii) the water supply work approval number of the water supply work used to take the water on that date; and

(iv) the purpose or purposes for which the water was taken on that date.

This data will be captured by the flow meter at each extraction point which are logged with data stored in OCC’s data management system.
3.3 GROUNDWATER MONITORING REPORTING

3.3.1 MONTHLY EXTRACTION REPORT

Monthly groundwater extraction reporting will be completed as part of the Attachment E: Hydrology Monitoring Program Monthly Extraction Report.

3.3.2 ANNUAL HYDROLOGY REPORT

Annual groundwater reporting will be completed as part of the Attachment E: Hydrology Monitoring Program Annual Hydrology Report.

3.3.3 GROUNDWATER QUALITY

An Annual Groundwater Monitoring Report will be prepared and appended to the Annual Review (Section 4.4 – OEMP Reporting).

3.3.4 BREACH OF WAL CONDITION

When: If required

Actions: 1 Once OCC becomes aware of a breach of the WAL, the Water and Sewerage Strategic Manager must notify the Minister as soon as practicable.

2 The Minister must be notified by:
   • Email: water.enquiries@dpi.nsw.gov.au; or
   • Telephone: 1800 353 104

3 Any notification by telephone must also be confirmed in writing within seven (7) business days of the phone call.

Who: The Water and Sewerage Strategic Manager is responsible for notifying the Minister if required.

Records: Email, phone record and letter.

3.4 GMP REVIEW

3.4.1 REVISION TO STRATEGIES, PLANS AND PROGRAMS

CoA C6 requires that OCC shall review, and if necessary revise, strategies, plans and programs included in the OEMP to the satisfaction of the Director-General within 3 months of:

a) the Annual Review (Section 4.4 – OEMP Reporting);

b) any Incident Report (Section 3.2.18 – Environmental Incident Management);

c) an Audit Report (Section 5.3 – Environmental Auditing and Compliance); or
d) any modification to the conditions of the Project Approval,

This is to ensure that plans and programs are updated on a regular basis, and incorporate any recommended measures to improve environmental performance.

### 3.4.2 DOCUMENT CONTROL

The following will be classed as ‘major’ revisions:

- Changes to processes;
- Changes to monitoring programs, either timing or parameters monitored;
- Changes made in response to an incident; and/or
- Changes requested by a relevant Government agency.

Major revisions will be identified by the whole number in the version number (i.e. 1.0, 2.0, 3.0....) and will be reviewed, approved and re-circulated as necessary.

The following will be classed as ‘minor’ revisions:

- Minor typing and grammar corrections;
- Changes to position titles; and
- Updates to recording forms to suit changes in operations.

Minor revisions will be identified by the decimal point in the version number (i.e. 1.1, 2.2, 3.3....) and will not require review and approval prior to re-circulation.

Major and minor revisions will be listed in the Revision History at the front of this document.
# Revision History

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## MACQUARIE RIVER HYDRAULICS

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Background

1.1 INTRODUCTION

The following management studies form part of the Orange Raw Water Supply Operational Environmental Monitoring Plan (OEMP).

The studies outlined only need to be undertaken once during the operation of the Orange raw water supply system. Any actions/recommendations arising from the studies shall be incorporated into the OEMP.

Once completed and reported, the studies can be removed from this section. Other specific studies may be added. In this way, the number of studies included in this section of the OEMP will vary.

The following management studies are included:
1. Operational noise and vibration review;
2. Macquarie River hydraulics; and
3. Macquarie River flow series and pumping trigger.
Noise and Vibration

2.1 REQUIREMENT

CoA D1 of the Project Approval:

Operational Noise and Vibration Review

D1 The Proponent shall, within six (6) months of commencing operations, unless otherwise agreed by the Director General, prepare and submit an Operational Noise and Vibration Review. The review shall:

(a) identify the Project specific noise and vibration criteria applicable;

(b) measure the operational noise and vibration levels at affected receivers;

(c) where the noise and vibration criteria was not achieved, the review shall present an analysis of all feasible and reasonable noise and vibration mitigation measures, and the ‘best practice’ achievable noise and vibration outcome achievable for each activity;

(d) identify the proposed mitigation measures to be implemented in order to meet the applicable noise and vibration criteria if operational noise and vibration levels exceed the specific criteria in D1(a); and

(e) include a consultation strategy with directly affected receivers on mitigation measures identified through the Community Communication Strategy in Condition C14.

2.2 DEFERMENT

The DP&E agreed to defer the completion of an Operational Noise and Vibration Review until a noise complaint is received (letter dated 1 April 2015). This agreement requires that OCC notify the DP&E:

- Upon receipt of any operational noise complaint and subsequent investigation to determine if the complaint was related to the operation of the Macquarie River to Orange pipeline; and

- Advise the timeframe for completion of the Operational Noise and Vibration Review should the complaint be related to operation of the Macquarie River to Orange pipeline and noise monitoring is required.
2.3 SCOPE

If required under Section 2.2, the study would be scoped to address the specific requirements of Project Approval CoA D1 as outlined above.

2.4 WHEN REQUIRED

If a noise complaint related to the operation of the Macquarie River to Orange pipeline is received and verified and it is determined that noise monitoring is required (refer to Section 2.2)

2.5 RESPONSIBILITY

The Water and Sewerage Strategic Manager shall be responsible for ensuring the Operation Noise and Vibration Review is completed as indicated.
Macquarie River Hydraulics

3.1 REQUIREMENT

CoA B1 of the Project Approval outlines the requirement for the preparation of an Aquatic Environment Monitoring Program (AEMP) which shall be developed:

(a) in consultation with DPI (NSW Office of Water and Fisheries NSW) and OEH;

(b) include a monitoring design to:

i. confirm predictions and identify changes in hydrology and aquatic ecology (including fish and aquatic and riparian vegetation); and

ii. determine the efficiency of the offtake design and screens to limit impingement, entrainment and minimise impacts to eggs, larvae or changes to recruitment of threatened aquatic species.

(c) include an appropriate number and location of monitoring points to determine impacts and changes to hydrology and aquatic ecology at:

i. Cobbs Hut Hole including the offtake and riffle or rockbar sections from operation of the pipeline;

ii. in Summer Hill Creek resulting from increased flow volumes and spills from Suma Park Dam; and

iii. other locations as necessary.

3.2 SCOPE

The study outlined in this section addresses CoA B1(b)(i) and B1(c)(i).

Other requirements of CoA B1 are addressed in the AEMP.

3.3 STUDY AIM

The aim is to verify water level changes in pools and riffles in the Macquarie River as a result of the operation of the Macquarie River to Orange pipeline.
3.4 STUDY APPROACH

3.4.1 MONITORING SITES

The verification of water level changes in pools and riffles will be measured at:

1. Cobbs Hut Hole pool at the river gauge (upstream of Pump Station 1 intake) and at a location downstream of the pump intake (downstream of the rock bar);
2. At two (2) riffle sites located approximately 200 m and 300 metres downstream of the pump intake.

3.4.2 MONITORING PARAMETERS

Measurements will be undertaken for three flow ranges:

1. 108 to 120 ML/day;
2. 180 to 200 ML/day; and
3. 300 to 350 ML/day.

These flow ranges have been selected as they are at the lower end of flows under which the pipeline will operate and impacts above these flows will be less.

Measurement will include:

- Water level at the river gauge (pool zone);
- Water level downstream of pump intake (pool zone);
- Water level and depth (riffle zone); and
- Average flow width (riffle zone).

For each flow range, baseline measurements will be undertaken without the Macquarie River to Orange pipeline Pump Station 1 operating.

The measurements will then be repeated approximately one (1) hour after the pumps have started to operate.

One set of measurements will be undertaken in each flow range.

3.4.3 MONITORING FREQUENCY

The verification of water level changes in the Cobbs Hut Hole pool and downstream riffles will be undertaken during the first year of operation only.

3.4.4 REPORTING

Results of the monitoring shall be detailed in a report that will be included with the first Annual review (refer to Section 4.4 – OEMP Reporting).
The need to do further monitoring of river hydraulics will be addressed in the report.

3.5  RESPONSIBILITY

The **Water and Sewerage Strategic Manager** shall be responsible for ensuring the Macquarie River Hydraulic Review is completed as indicated.
Macquarie River Flow Series

4.1 REQUIREMENT

CoA B5 of the Project Approval:

B5 The Proponent may revise the exiting river flow model, or utilise another river flow model, to determine the 80th percentile flows in the Macquarie River at Gauging Station 421192 under current catchment conditions, if agreed by the NOW and the Director General. In seeking agreement of NOW and the Director General, the Proponent shall:

(a) Calibrate and validate the model in accordance with current best practice;
(b) Operate the model to simulate daily river flows assuming the historical climate from the early 1890s until the present time was to repeat itself in the future;
(c) Examine the rigour of the model to accurately predict the streamflows over this period including wet and dry periods and the severe droughts which occurred in the later part of the 19th century and the early part of the 21st century;
(d) Document the model’s establishment, calibration, validation and operations;
(e) Calculate the 80th percentile river flow at Cobbs Hut Hole;
(f) Use the modelled river flows to inform the Decision Support Tool referred to in condition B3;
(g) Submit the model and its documentation for peer review by NOW (or a suitably qualified person agreed to by NOW and the Director General). A key objective of this review will be to determine whether the model is ‘fit for purpose’ in calculating the 80th percentile river flow and in calculating river flow sequences for use in the Decision Support Tool;
(h) Submit the model and its documentation to the Director General, including any peer review comments and any changes to the model, its documentation and the 80th percentile pumping trigger, resulting from that review.

No water transfers from the Macquarie River shall be permitted at the revised 80th percentile pumping trigger (except where this may be higher than the 80th percentile flow rate already adopted) without the approval of the Director General. Any future revision of the model or the pumping trigger shall also require approval of the Director General in accordance with this condition.
4.2 SCOPE

The study would be scoped to address the specific requirements of Project Approval CoA B5 as outlined above.

4.3 WHEN REQUIRED

The study will be undertaken only if Orange City Council determine that a review of the river flow series and pumping trigger is warranted.

4.4 RESPONSIBILITY

The Water and Sewerage Strategic Manager shall be responsible for coordinating this study if required.
STAFF TRAINING REGISTER

Completion and signing of the **Staff Training Register** confirms that:

- The trainees have received the appropriate training and have a full understanding of the training provided (i.e. Induction, OEMP).
- The trainees will commit to incorporating their training into daily work practices.
- The trainer has fully trained the trainees in the appropriate inductions/procedures/plans/documents, and is confident that suitable competency has been demonstrated by the trainees.

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STAFF TRAINING REGISTER

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Staff Training Register

Document No. Staff Training Register_Version 2.1.Dox
Version: 2.1
Issued: 15 June 2016
**STAFF TRAINING REGISTER**

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<tr>
<td>15/06/16</td>
<td>Wayne Beatty</td>
<td></td>
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<tr>
<td>15/06/16</td>
<td>Andrew Wright</td>
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<tr>
<td>15/06/16</td>
<td>John Locke</td>
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<tr>
<td>15/06/16</td>
<td>Chris Daved</td>
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<tr>
<td>15/06/16</td>
<td>Jon Francis</td>
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<tr>
<td>15/06/16</td>
<td>John Davies</td>
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</tr>
</tbody>
</table>
STAFF TRAINING REGISTER

Completion and signing of the Staff Training Register confirms that:
- The trainees have received the appropriate training and have a full understanding of the training provided (i.e. Induction, OEMP, WAP’s, PIRMP).
- The trainees will commit to incorporating their training into daily work practices.
- The trainer has fully trained the trainees in the appropriate inductions/procedures/plans/documents, and is confident that suitable competency has been demonstrated by the trainees.

<table>
<thead>
<tr>
<th>Date of Training</th>
<th>Trainee Name</th>
<th>Trainer Name</th>
<th>Details of Training Completed</th>
<th>Trainee Signature</th>
<th>Trainer Signature</th>
</tr>
</thead>
<tbody>
<tr>
<td>27/06/16</td>
<td>Jones Locke</td>
<td>Martin Haeger</td>
<td>Attachments D, F, G, H, L and M</td>
<td></td>
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<tr>
<td></td>
<td>Geoff Warren</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Josh Barnes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Samantha McCutheke</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wayne Beatty</td>
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<tr>
<td></td>
<td>Jon Francis</td>
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</tr>
</tbody>
</table>
**STAFF TRAINING REGISTER**

Completion and signing of the **Staff Training Register** confirms that:

- The trainees have received the appropriate training and have a full understanding of the training provided (i.e. Induction, OEMP, WAP’s, PIRMP).
- The trainees will commit to incorporating their training into daily work practices.
- The trainer has fully trained the trainees in the appropriate inductions/procedures/plans/documents, and is confident that suitable competency has been demonstrated by the trainees.

<table>
<thead>
<tr>
<th>Date of Training</th>
<th>Trainee Name</th>
<th>Trainer Name</th>
<th>Details of Training Completed</th>
<th>Trainee Signature</th>
<th>Trainer Signature</th>
</tr>
</thead>
<tbody>
<tr>
<td>21/09/2016</td>
<td>G Jones Locke</td>
<td>Martin Haegs</td>
<td>OEMP overview, Attachments C, D, E, F, G, H, I, J</td>
<td></td>
<td></td>
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<tr>
<td>&quot;</td>
<td>Jon Francis</td>
<td>&quot;</td>
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<td>&quot;</td>
<td>Jake Lynam</td>
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<tr>
<td>&quot;</td>
<td>Craig Rawshorne</td>
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<td>&quot;</td>
<td>Geard Villis</td>
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<tr>
<td>&quot;</td>
<td>Marek Grobara</td>
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</tr>
<tr>
<td>&quot;</td>
<td>Eileen O'Shes</td>
<td>&quot;</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>&quot;</td>
<td>Gerall Warren</td>
<td>&quot;</td>
<td>&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&quot;</td>
<td>Josh Barnes</td>
<td>&quot;</td>
<td>&quot;</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Wayne Beatty
Agency Consultation Summary

Agency consultation, as part of the OEMP preparation, is limited to that required by specific conditions or to clarify specific issues.

The Project Approval Condition of Approval (CoA) D2 requires that the OEMP be prepared in consultation with Office of Environment and Heritage (OEH) and Department of Primary Industries (DPI) and Department of Industry – Water (DoI Water), as relevant.

CoA B1 requires that the Aquatic Environment Monitoring Program be prepared in consultation with DPI Fisheries, DoI Water and OEH as relevant.

CoA B3 requires that the Decision Support Tool be prepared in consultation with DoI Water and the Dams Safety Committee as relevant.

CoA D1 requires the completion of an operational noise and vibration review within six (6) months of commencing operations. This condition has been deferred.

A summary of agency consultation is provided in Table M1.

**Table M1 – Summary of agency consultation**

<table>
<thead>
<tr>
<th>Agency</th>
<th>Consultation</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aquatic Environment Monitoring Program</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DPI Fisheries</td>
<td>Version 4.0 sent by email to Dr Chris Walsh on 27 February 2015</td>
<td>Email response received 26 March 2015 with statement that DPI Fisheries in general agree with the document. Some comments were attached that related to DPI Fisheries current monitoring engagement with OCC and ability to be able to assist with hydraulic monitoring. No specific changes were made to the AEMP as a result of these comments.</td>
</tr>
<tr>
<td>DPI Water</td>
<td>Version 4.0 sent by email to Tim Baker on 27 February 2015</td>
<td>Email response received 18 March 2015 with attached letter which also included comments from the hydrometric division. Comments from the hydrometric division related to the accuracy of the control section at the Third Crossing gauging station. OCC is continuing to work with DPI Water (now DoI Water) to improve this. This work is outside the scope of this OEMP. Other comments made by DPI Water (now DoI Water) have been addressed in the Hydrology Monitoring Program (frequency of data capture and management of data from stream gauging stations) and identification of the gauging station number for the Macquarie River.</td>
</tr>
</tbody>
</table>
### Table M1 – Summary of agency consultation

<table>
<thead>
<tr>
<th>Agency</th>
<th>Consultation</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>OEH</td>
<td>The OEH advised OCC in an email dated 29 July 2013 that DPI Fisheries is the most appropriate body to provide advice on fish monitoring associated with the MOP. This was during preparation of the original AEMP (for the Macquarie River only) which was subsequently approved by the Director-General.</td>
<td>Revised AEMP developed in consultation with DPI Fisheries (see above)</td>
</tr>
<tr>
<td><strong>Decision Support Tool</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DPI Water</td>
<td>Version 2.0 sent by email to Tim Baker on 21 October 2015</td>
<td>Email response received 11 December 2015 from Brendan Fletcher with attached letter.</td>
</tr>
<tr>
<td></td>
<td>DPI Water’s (now DoI Water) comments discussed with Tim Baker and verification email sent to confirm the outcome of discussion on 26 February 2016.</td>
<td>Email response received 1 March 2016 from Tim Baker concurring with the outcome of the discussions and changes made to the DST.</td>
</tr>
<tr>
<td>Dams Safety Committee</td>
<td>Email from OCC (Wayne Beatty) to Steve Knight, Dams Safety Committee (DSC) on 6 November 2016 offering a copy of the DST for review.</td>
<td>Email response received 17 November 2016 from Steve Knight advising that the DSC did not want to review the DST and had no further comment to make.</td>
</tr>
<tr>
<td><strong>Operational Noise and Vibration Review</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DP&amp;E</td>
<td>OCC written request to defer the Operational Noise and Vibration Review required under CoA D1 received by DP&amp;E 10 March 2015.</td>
<td>DP&amp;E agreed to the request to defer the completion of an Operational Noise and Vibration Review until a verified noise complaint is received. DP&amp;E letter dated 1 April 2015.</td>
</tr>
</tbody>
</table>
Attachment N
OCC INCIDENT MANAGEMENT PROCEDURES
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  1.2 Purpose .......................................................................................................................................... 4
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<table>
<thead>
<tr>
<th>Abbreviation / Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCP</td>
<td>Critical Control Point</td>
</tr>
<tr>
<td>DTS</td>
<td>Director, Technical Services</td>
</tr>
<tr>
<td>GM</td>
<td>General Manager</td>
</tr>
<tr>
<td>HACCP</td>
<td>Hazard Analysis Critical Control Point</td>
</tr>
<tr>
<td>IMP</td>
<td>Incident Management Plan</td>
</tr>
<tr>
<td>IRP</td>
<td>Incident Response Procedure</td>
</tr>
<tr>
<td>NOW</td>
<td>NSW Office of Water</td>
</tr>
<tr>
<td>OCC</td>
<td>Orange City Council</td>
</tr>
<tr>
<td>PHU</td>
<td>Public Health Unit</td>
</tr>
<tr>
<td>QCP</td>
<td>Quality Control Point</td>
</tr>
<tr>
<td>WQ</td>
<td>Water Quality</td>
</tr>
<tr>
<td>WQMP</td>
<td>Water Quality Management Plan</td>
</tr>
<tr>
<td>WQMS</td>
<td>Water Quality Management System</td>
</tr>
<tr>
<td>WTP</td>
<td>Water Treatment Plant</td>
</tr>
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</table>
1 Introduction

1.1 Background

Considered and controlled responses to incidents or emergencies that can compromise the safety of water quality are essential for protecting public health, as well as maintaining consumer confidence and the organisation’s reputation. Although preventive strategies are intended to prevent incidents and emergency situations from occurring, some events cannot be anticipated or controlled, or have such a low probability of occurring that providing preventive measures would be too costly. For such incidents, there must be an adaptive capability to respond constructively and efficiently.

The development of Orange City Council’s (OCC) water quality Incident Response Procedures (IRPs) has involved a review of the hazards and events that can lead to emergency situations, such as:

- Non-conformance with guideline values and other requirements
- Accidents that increase levels of contaminants (e.g. spills in catchments, fires in catchments, incorrect dosing of chemicals)
- Equipment breakdown and mechanical failure
- Prolonged power outages
- Extreme weather events (e.g. flash flooding, cyclones)
- Natural disasters (e.g. bushfire, earthquakes, lightning damage to electrical equipment)
- Human actions (e.g. serious error, sabotage, strikes).

1.2 Purpose

This document is the Water Quality Incident Management Plan (WQIMP) for Orange City Council (OCC) drinking water.

The purpose of the plan is to provide guidance to the operations team on the correct response to an incident or emergency.

For specific instruction on how to handle a particular incident, refer to the individual IRPs (refer to Section 4.1).

1.3 Scope

This IMP applies to the operation and maintenance of OCC drinking water supply for the city of Orange and villages of Spring Hill and Lucknow. The Ploughmans Creek North Orange and Blackmans Swamp Creek stormwater recycling schemes do not receive detailed attention in the plan, except where they impact drinking water. This also applies to harvested water from the Macquarie River.

1.4 Related Documents

For process incidents refer to the Critical Control Point or Quality Control Point Procedures. These procedures cover the following:

- SWI221312 WTP WQ – Coagulation; addresses underdose or overdose of coagulant
- SWI221313 WTP WQ – Filtration; monitoring of filter performance and actions
- SWI221314 WTP WQ – pH Correction; addresses post-filtration pH correction
- SWI221315 WTP WQ – Fluoridation; addresses underdose or overdose of fluoride
- SWI221316 WTP WQ – Ozonation; addresses underdose or overdose of ozone
- SWI221317 WTP WQ – Backwash Protocol; addresses backwash effectiveness through monitoring of turbidity, differential pressure and filtration time
- SWI221318 WTP WQ – Chlorination; addresses underdose or overdose of chlorine for primary disinfection
- SWI221319 WTP WQ – Secondary Chlorination; addresses underdose or overdose of chlorine for maintaining residual
- SWI221320 Suma Park Dam Profiling; addresses raw water quality through monitoring of temperature and dissolved oxygen depth profile in Suma Park Dam
- SWI220501 Emergency Spill Response; addresses chemical spills within the catchment
- SWI220505 Sewer Overflow Management; response procedures for sewer overflows
- SWI221003 Storing Water in Holding Dam; addresses raw water quality through pumping rules for the harvesting scheme holding dam
- SWI221005 Batch Pond Operation; addresses raw water quality through pumping rules for recycled stormwater batch ponds pumping to Suma Park Dam
- SWI221007 Gross Pollutant Traps; addresses raw water quality through operation of gross pollutant traps in tributaries feeding Blackmans Swamp Creek

Figure 1: Council Document Framework

For management of commonly occurring incidents which are within the capacity of the individual combat agencies of Emergency Services and Police Services, refer to the Local Emergency Management Plan (formerly Displan), which includes:

- storms and floods;
- rural and urban fires;
- large road and rail accidents;
- earthquakes;
- hazardous material disaster;
• industrial accident including liquid spills; and
• major dam failures.

1.5 References

SWI220512 Reporting Drinking Water Quality Incidents, Orange City Council.

REG220201 Document Register V1, Orange City Council.

REG221401 WQRACCP Risk Register V8.1, Orange City Council.

1.6 Document Ownership, Approval and Review
The plan is owned by the Director of Technical Services (DTS), and developed and revised by water quality managers of OCC. The DTS is responsible for ensuring that this plan is reviewed annually.

1.7 Definitions

1.7.1 Incident Categories
Incidents are categorised based on the level of management and resources required to control the incident, mitigate impacts and return to normal operations. Incidents may be categorized as either Minor or Major.

*Emergency*
An incident that happens unexpectedly and demands immediate action.

*Incident*
An unplanned event or chain of events resulting in, or having the potential for:

- Injury
- Illness
- Damage (loss) to assets
- Damage to the environment
- Damage to third parties
- Damage to the reputation of the company
- Breach of contract, legislation, or licences
- Non-compliance with guidelines or legislation.

*Minor Incident*
An incident which can be managed as part of routine operations under the control of a Water Treatment Operator, Water Treatment Supervisor, Reticulation Crew or Water and Sewer Reticulation Supervisor. An incident which represents a low risk to human health, a low overall impact, and localised environmental impact. Equivalent to risk consequence descriptors Insignificant and Minor (see Table 1).
**Major Incident**

An incident which requires a coordinated response by a number of operations staff led by a Supervisor, and which may require specialist assistance. An incident which represents a potentially serious risk to human health, a serious overall impact, or serious environmental risks. Equivalent to risk consequence descriptors Moderate, Major and Catastrophic (see Table 1).

**Table 1 Risk Consequence Descriptors (ADWG 2011)**

<table>
<thead>
<tr>
<th>Risk Consequence Descriptor</th>
<th>Risk Consequence Description</th>
<th>Incident Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insignificant</td>
<td>Insignificant impact&lt;br&gt;Little disruption to normal operation&lt;br&gt;Low increase in normal operation costs</td>
<td>Minor</td>
</tr>
<tr>
<td>Minor</td>
<td>Minor impact for small population&lt;br&gt;Some manageable operation disruption&lt;br&gt;Some increase in operating costs</td>
<td></td>
</tr>
<tr>
<td>Moderate</td>
<td>Minor impact for large population&lt;br&gt;Significant modification to normal operation but manageable&lt;br&gt;Operation costs increase&lt;br&gt;Increase monitoring</td>
<td>Major</td>
</tr>
<tr>
<td>Major</td>
<td>Major impact for small population&lt;br&gt;Systems significantly compromised and abnormal operation if at all&lt;br&gt;High level of monitoring required</td>
<td></td>
</tr>
<tr>
<td>Catastrophic</td>
<td>Major impact for large population&lt;br&gt;Complete failure of systems</td>
<td></td>
</tr>
</tbody>
</table>

1.8 **NSW Health requirements for reporting drinking water quality incidents**

The types of incidents that require reporting are:

1. Detection of *Escherichia coli* (*E. coli*);
2. Detection of a pathogen (e.g. *Cryptosporidium* or *Giardia*);
3. Detection of a physical or chemical parameter exceeding the guideline value in the *Australian Drinking Water Guidelines* (ADWG);
4. Detection of radioactivity exceeding gross alpha and gross beta screening values in the ADWG;
5. Failure to achieve ≥0.2 mg/L chlorine at the last point of primary disinfection before consumers;
6. Treated water turbidity >1 NTU leaving the WTP;
7. Filtered water turbidity >1 NTU from one filter for more than one hour, where the filtered water cannot be diverted to waste; or
8. An event or series of events likely to adversely affect drinking water quality.

Incidents must be reported by telephone to the local Public Health Unit (PHU) as soon as practicable. This should be followed by an email notification in the format shown in SWI220512 Reporting Drinking Water Quality Incidents.
2 Internal Structure During Emergencies

This section describes the key personnel who will react to emergencies, giving consideration to IRPs, communication to NSW Health, authorities and delegations.

The established hierarchy, already applying to normal work related activity, will generally apply during an emergency. Under normal operating conditions this will mean responsibilities are distributed as follows.

Table 2 Authorities during an incident

<table>
<thead>
<tr>
<th>Officer</th>
<th>Contact Details</th>
<th>Responsibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>WTP Operators</td>
<td></td>
<td>Attend the scene, Assess the incident, Contact the Supervisor, Follow relevant Incident Response Protocol and any assigned tasks or actions.</td>
</tr>
<tr>
<td>Retic crew - water</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water Treatment Supervisor</td>
<td></td>
<td>Attend site, Determine cause of incident and extent Notify Manager,</td>
</tr>
<tr>
<td>Works Engineer - Water and Sewer</td>
<td></td>
<td>Organise collection, storage and delivery of samples to laboratory, Ensure all relevant follow-up notifications as required, Investigate and implement factors which will prevent recurrence.</td>
</tr>
<tr>
<td>Water Management Officer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water Treatment Manager</td>
<td></td>
<td>If required, notify NSW Health immediately by phone and discuss situation and action to be taken, Notify senior management DTS,</td>
</tr>
<tr>
<td>Water &amp; Sewerage Strategic Manager</td>
<td></td>
<td>Notify and liaise with community relations unit, Ensure NSW Health notifications are followed up with formal written notification if required, Arrange for notification email to be circulated in W&amp;S, Ensure follow-up investigation and reporting is undertaken.</td>
</tr>
<tr>
<td>Manager Corporate and Community Relations</td>
<td></td>
<td>Manage the communications strategy required, including: Management of customer service and call outs, Notification and updates of Council staff, Councillors and GM, Notify land owner/resident(s) of incident, proposed actions, Arrange letterbox drops and door-knocks where appropriate, Arrange warning signs where appropriate (Refer document SWI 220405)</td>
</tr>
</tbody>
</table>
3 Communication

Effective communication is vital in managing incidents and emergencies. Clearly defined protocols for both internal and external communications have been established, with the involvement of relevant agencies, including health and other regulatory agencies. These protocols will include a contact list of key people, agencies and businesses, detailed notification forms, procedures for internal and external notification, and definitions of responsibilities and authorities.

Maintaining consumer confidence and trust during and after an incident or emergency is essential and is largely affected by how incidents and emergencies are handled. A public and media communication strategy has been developed (SWI220405) and is managed through Manager Corporate and Community Relations.

Draft public and media notifications have been prepared in advance and formatted for the target audience. The Manager Corporate and Community Relations, an appropriately trained and authoritative contact has been designated to handle all communications in the event of an incident or emergency. All employees should be kept informed during any incident, because they provide informal points of contact for the community.

Consumers will be told when an incident has ended and be provided with information on the cause and actions taken to minimise future occurrences. This type of communication will help allay community concerns and restore confidence in the water supply. Interviews and surveys of a representative portion of the community may be employed as a valuable tool for establishing consumer perceptions of events and how they were managed.

3.1 Incident & Emergency Notification and Reporting

3.1.1 Notification Process

A fast and efficient notification process is vital when an incident arises. As soon as an event is identified the reporting and notification process should be implemented.

Remember: It is always better to over-react to an incident. An incident can be de-escalated with much less impact (e.g. stand-down of a fire service who has been called to the site) than can an incident that has got out of control due to indecisive action.

OCC requires that:

- all minor incidents are reported to the relevant Supervisor as soon as practicable of the incident occurring, and
- all major incidents are reported to the Water Treatment Manager and Water and Sewerage Strategic Manager as soon as practicable of the incident occurring.

3.1.2 Contact List

Drinking water quality incidents of risk to public health must be reported to the PHU as soon as practicable. This will be to gain advice from PHU on course of action. This may be followed with a conference call depending on the severity of the incident. Whilst on the phone, obtain the appropriate e-mail address for the follow up written notification. Contact details are in Table 3.
Table 3: Public Health Unit Contact Details

<table>
<thead>
<tr>
<th>Agency</th>
<th>Business Hours</th>
<th>After Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public Health Unit (Bathurst)</td>
<td>Ph: 02 6339 5601 Fax: 02 6339 5173</td>
<td>Mob: 0428 400 526 (ask for Public Health Officer on call)</td>
</tr>
</tbody>
</table>

Personnel to report a drinking water quality incident to PHU and gain advice are listed in Table 4. Once the initial call has been made it may be necessary to hold a conference call with PHU. All those listed in Table four are to attend.

Table 4: Authorised personnel for Incident Reporting to Public Health Unit

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Location</th>
<th>Contact Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary</td>
<td>Water Treatment Manager</td>
<td>Civic Centre</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Water and Sewerage Strategic Manager</td>
<td>Civic Centre</td>
<td></td>
</tr>
<tr>
<td>Secondary</td>
<td>Water Treatment Supervisor</td>
<td>Works Depot</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Water Management Officer</td>
<td>WWTP</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Works Engineer - Water and Sewer</td>
<td>Works Depot</td>
<td></td>
</tr>
<tr>
<td>Senior Management</td>
<td>Director Technical Services</td>
<td>Civic Centre</td>
<td></td>
</tr>
<tr>
<td></td>
<td>General Manager</td>
<td>Civic Centre</td>
<td></td>
</tr>
</tbody>
</table>

Table 5 lists those internal staff to be contacted for any reportable event to PHU. In the event PHU requires issue of a boil water alert, the communication strategy will be implemented and will raise the level of engagement with some internal stakeholders (e.g. Customer Service).

Table 5: Notification of Council Personnel

<table>
<thead>
<tr>
<th>Notification Priority</th>
<th>Council function</th>
<th>Contact person</th>
<th>Phone number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Immediate</td>
<td>Supervisors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>As soon as is practicable</td>
<td>Water &amp; Sewer Management</td>
<td>Customer Service W&amp;S management as above</td>
<td>Internal email</td>
</tr>
<tr>
<td></td>
<td>Internal stakeholders</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3.1.3 Incident Reporting

Drinking water quality incidents will be reported to NSW Health in accordance with NSW Health requirements and SWI220512 Reporting Drinking Water Quality Incidents.
4 Incident and Emergency Management

4.1 Incident Response Procedures

OCC will document response procedures to potential incidents and emergencies. These procedures will be developed in consultation with relevant regulatory authorities and other key agencies, and are consistent with existing government emergency response arrangements.

Key areas which will be addressed in incident and emergency response procedures include:

- Response actions, including increased monitoring
- Responsibilities and authorities internal and external to the organisation
- Plans for emergency water supplies
- Communication protocols and strategies, including notification procedures (internal, regulatory body, media and public)
- Mechanisms for increased health surveillance.

Incident Response Procedures will address the following:

- Handling water quality complaints (SWI220407)
- Blue green algae management (GUI221313)
- Contaminated raw water (SWI220509)
- Reporting water quality incidents (SWI220512)
- Boil water alert (SWI220513)
- Equipment breakdown (SWI220508)
- Prolonged power failure (SWI220510)
- Extreme weather event and natural disasters (SWI220511)
- Incident investigation (SWI221801)

The public and media communications strategy (for drinking water incidents) has been developed and held by the Corporate and Community Relations section of Council (SWI220405).

4.2 Incident investigation and de-brief

Following any incident or emergency situation, an investigation of the incident or emergency will be undertaken and all involved staff will be debriefed to discuss performance and address any issues or concerns.

The investigation should consider factors such as:

- What was the initiating cause of the problem?
- How was the problem first identified or recognised?
- What were the most critical actions required?
- What communication problems arose and how were they addressed?
- What were the immediate and longer-term consequences?
- How well did the protocol function?

Appropriate documentation and reporting of the incident or emergency will also be established. The organisation should learn as much as possible from the incident to
improve preparedness and planning for future incidents. Review of the incident may indicate necessary amendments to existing protocols. Documents established for this process are:

SWI221801 Incident Investigation procedure
FRM221801 Incident Investigation form
FRM221802 Incident Debrief Report template
5 Training and Review

5.1 Staff Training
Employees will be trained in emergency response to ensure that they can manage any potential incidents or emergencies effectively. Incident and emergency response plans will be regularly reviewed and practised. This improves preparedness and provides opportunities to improve the effectiveness of plans before an emergency occurs.

5.2 Emergency Fire and Spill Response
In OCC's water quality risk assessment, contaminated raw water as a result of truck rollover and/or chemical spill in the catchment has been identified as a possible hazardous event. In response to this a formal Memorandum of Understanding has been established with Fire and Rescue NSW and documented in SWI220501_Emergency Spill and Fire Response Communication.

5.3 Plan Review
It is required that the plan be tested every 12 months. The Water Management Officer will arrange for a desktop test of the plan involving all water treatment plant staff once per year.

The internal and external contact list held within this document will be revised annually by the Water Management Officer. This document is held within OCCs Water Quality Management System.

It is the responsibility of Technical Services Administration to update the external contact list in the Emergency Plan, at a minimum, once a year. The contact lists are provided in the Appendices C of the Emergency Plan.
6 Document Control

All documents relating to water quality for Orange City Council, including boil water notifications, are held within the water quality management system.

A separate folder has been established for the emergency response documents within this system with links to each document under E:\Technical_Services\Water Quality Management System\1. Water Quality Incident Documents. This folder includes the response management documents for water quality incidents that can potentially affect the community. Staff are advised to have a link on their desktop for quick access.

Any modified templates are to be saved under a separate folder under 1. Water Quality Incident Documents and to TRIM. The new folder for each event is to be titled ‘Event date’. These documents will be placed into TRIM once finalised. A subfolder, ‘Boil Water Templates’ will contain templates of documents required for all communication tools.

This folder also contains links to documents related to Critical Control Points and Quality Control Points identified in the Blackmans Swamp Creek Stormwater Harvesting Scheme water quality risk assessment.
7 Appendices

APPENDIX 1. COMMUNICATION FLOW FOR WATER QUALITY INCIDENTS

START

Incident identified

Report to Supervisor

Level of incident? reportable

Low

W&S staff rectify issue. Increased monitoring.

W&S staff complete incident investigation and debrief as required.

W&S staff to complete follow up actions

End

Yes

PHU advise of Boil Water notice or no water supply

Contact Manager Corporate and Community Relations to initiate Public and Media Communications Strategy

No

Supervisor Contact Manager. Manager or supervisor contact PHU

Incident debrief to be held with all relevant parties

Staff assigned to complete follow-up actions

End
1 PURPOSE
This procedure describes the process for investigating water quality incidents.

2 SCOPE
This procedure applies to the Orange City Council (OCC) water supply system (treatment and reticulation) for the city of Orange and the villages of Spring Hill and Lucknow.

3 PROCEDURE

3.1 Definition

3.1.1 Incident
An unplanned event or chain of events resulting in, or having the potential for:
- injury;
- illness;
- damage (loss) to assets;
- damage to the environment;
- damage to third parties;
- damage to the reputation of the company;
- breach of contract, legislation, or licences; and
- non-compliance with guidelines or legislation.

3.2 Investigation
At minimum, all major incidents will be investigated. The Water Treatment Manager or Water and Sewerage Strategic Manager may also require an investigation of a minor incident.

It is the responsibility of the relevant Supervisor or delegate to lead an incident investigation.

All incident investigations (other than WHS incidents) are to be recorded on FRM221801 Incident Investigation Form and submitted to the Water Treatment Manager or Water and Sewerage Strategic Manager.

3.2.1 Root Cause Analysis
Root cause analysis shall be applied to all incident investigations.

Root cause analysis involves examining the cause and effect chain of events leading to an incident.

The main steps in root cause analysis are:
1. Working backwards in the system, starting from the incident, identify all the possible causes relating to the environment, training, procedures, communication, hazards, work behaviour, and equipment.
2. From all the possible causes determine the major cause.
3. Analyse the major cause. Keep asking “Why did this happen” until the root cause is determined.
4. Identify the corrective steps for the major cause and for all contributory causes.
3.3 Investigating Drinking Water Quality Incidents
All drinking water quality incident investigations must also be reported to NSW Health; see SWI220512 Reporting Water Quality Incidents.

3.4 Debrief

3.4.1 Debrief Instructions
The Water Treatment Manager or Water and Sewerage Strategic Manager will determine when to conduct a formal debrief. All debriefs will be recorded on an Incident Debrief Form and submitted to the Water Treatment Manager or Water and Sewerage Strategic Manager.

The Incident Debrief process involves a four-stage approach:

3.4.1.1 Data gathering
Information is gathered from all personnel involved in the incident by carefully working through the whole scenario to ensure the correct sequence of events is recorded. All events within the incident should be recorded chronologically.

3.4.1.2 Analysis Phase
Information gathered is analysed to obtain an understanding of factors which led to the incident, its causes and lessons to be learnt. Such analysis would normally take place in a debrief workshop with input from the Operations Team as well as external experts.

3.4.1.3 Recommendation Phase
Actions are then recommended which will minimise risk of re-occurrence or impact of such incidents. These actions or outcomes should also be used to critically review PLN220501 Water Quality Incident and Emergency Management Plan and individual Incident Response Procedures.

3.4.1.4 Implementation Phase
The recommendations coming out of the debrief process should be submitted for approval and an implementation program devised and executed as soon as possible.

Responsibilities in performing the corrective actions will be assigned by the Water Treatment Manager. Progress of the implementation stage should be reported on during normal Team meetings.

The implementation phase for each debrief will contain actions designed to share the lessons learnt from the incidents across OCC's operating facilities and projects.

3.4.2 Debrief Report Format
FRM221802 Incident Debrief Report Template shall be used for debriefing water quality incidents.

It is suggested that the Debrief Report includes the following:
- **Event Title**, Date of Occurrence, Date of Debrief;
- **List of Attendees** - Their normal work position, and their role in the incident;
• **Description of Incident** - Including location, each event in chronological order and their impact, as well as the overall impact of the incident on personnel, the community, the plant, the environment and the Council;

• **Issues and Recommendations** - Issue summary, recommended actions or proposed course of action, person responsible for following up action and, if applicable, the time frame to follow up. This section should cover as a minimum:
  o Overall speed / effectiveness of response;
  o External perceptions;
  o Personnel – well-being, welfare and training;
  o Equipment;
  o Processes and procedures including availability and usefulness of a relevant specific incident and emergency response procedure;
  o Deficiencies - lessons learned.

• **Distribution** - Distribution should be to all Debrief attendees. Distribution outside the briefing attendees should be discussed at the debrief and approved. A list of all who will receive a copy should be listed on the distribution list;

• **Annexes** - Annexes should include the Time Log (usually the Incident Manager’s Log) or an event schedule of the Incident.

3.4.3 **Statutory Investigations**

In a situation where a statutory investigation has to be conducted, it is of the highest importance that all staff cooperate as much as possible and in particular all staff have to ensure that all potential evidences is preserved.

These include:

- Coronial inquiry in case of fire or fatalities;
- Relevant government authorities which require investigation (Department of Industrial Relations, Department of Environment and Heritage, Work Cover).

3.4.4 **Sharing of Debrief Outcomes**

It is crucial that any lessons learnt from the incident and subsequent debrief process are shared across OCC. As such the Water Treatment Manager or Water and Sewerage Strategic Manager shall ensure that the findings of the debrief are distributed to all Operations/Project Teams and instructions given to implement on any recommendation that may minimise the risk of a similar incident occurring at other operating facilities. After a crisis or potential crisis has occurred, the relevant risks will be reassessed.

3.4.5 **Restoration and Reconstruction**

Any restoration, reconstruction and/or clean up required after the incident has been declared over, shall be carried out as soon as resources and funds allow. All restoration and clean up work is to be dealt with in the following order of priority:

- Work that ensures the safety of personnel and the community;
- Work that restores plant process and protects the environment;
- Work that protects the Commercial performance of the Council.

4 **CRITICAL CONTROL POINTS (CCP)**

N/A
5 QUALITY CONTROL POINTS (QCP)
N/A

6 OPERATING RULES
N/A

7 MONITORING
This procedure may be subject to internal audit and review.

8 MAINTENANCE AND CALIBRATION
N/A

9 REMEDIAL ACTION
N/A

10 DATA MANAGEMENT
Copies of forms such as the incident investigations will be kept in the water quality management system under E:\Technical_Services\Water Quality Management System\Reports

11 REPORTING
All incidents must be reported to NSW Health and management as per SWI220512 Reporting Water Quality Incidents.

12 RESPONSIBILITIES

| Water Treatment Manager | • Determine whether an incident debrief is required  
| | • Assign responsibilities for corrective actions  
| | • Ensure that debrief findings are distributed appropriately to Operators and/or Supervisors  
| Water Treatment Operators | • Provide input to incident debrief  
| | • Carry out corrective actions assigned by Water Treatment Manager  
| Water Treatment Supervisor | • Provide input to incident debrief  
| | • Carry out corrective actions assigned by Water Treatment Manager  
| or Water and Sewerage Strategic Manager | • Determine whether an incident debrief is required  
| | • Assign responsibilities for corrective actions  
| | • Ensure that debrief findings are distributed appropriately to Operators and/or Supervisors  
| Reticulation Crew | • Provide input to incident debrief  
| | • Carry out corrective actions assigned by Water Treatment Manager  
| Water and Sewerage Reticulation Supervisor | • Provide input to incident debrief  
| | • Carry out corrective actions assigned by Water Treatment Manager  

13 REFERENCES
- SWI220512 Reporting Water Quality Incidents
- PLN220501 Incident and Emergency Management Plan
- FRM221801 Incident Investigation
- FRM221802 Incident Debrief Report Template
APPENDIX 1. PROCESS MAP

START

Minor Incident

Incident reportable to NSW Health?

Yes

Major Incident

Conduct Incident Investigation

No

Water Treatment Manager requests incident investigation?

Yes

No

Record investigation on Incident Investigation Form

Submit form to Water Treatment Manager

Update reports sent to NSW Health with investigation details

Incident reported to NSW Health?

Yes

No

Water Treatment Manager requests debrief?

Yes

No

Conduct Incident Debrief

Record debrief on Incident Debrief Form

Submit report to Water Treatment Manager

END

Owner: J Francis   Reviewed By: N Reid, G Warren   Date: 17/11/2013 Version: 1 page 5 of 5
Describe the immediate impact of the incident:

Reconstruct the sequence of events that led to the incident:

1.

Identify the Root Cause (Working backwards in the system, starting from the incident, identify all the possible causes relating to the environment, training, procedures, communication, hazards, work behaviour, and equipment. From all the possible causes determine the major cause. Analyse the major cause. Keep asking “Why did this happen” until the root cause is determined).
What were the immediate actions taken in response to the incident?

Supporting evidence:

<table>
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<th></th>
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<th>No</th>
<th>Attached?</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
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<td>Diagram of incident</td>
<td></td>
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<td>Photographs taken?</td>
<td></td>
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<td>Videotape taken?</td>
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<td>Audiotape recorded?</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Samples taken?</td>
<td></td>
<td></td>
<td>Results attached?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Trends printed?</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Provide details of corrective action to be taken:

<table>
<thead>
<tr>
<th>Corrective Action</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tr>
</tbody>
</table>

Prepared by:

Signature

Date:

Distribution:

Managers’ Comments:

Incident investigation closed out?  Yes  No

Signature:  Date:  

NOTE: If this incident investigation is related to a CCP breach for drinking water, this document MUST be forwarded to the Public Health Unit.

Attach extra paper if required.
1 PURPOSE
This procedure describes the process for reporting drinking water quality incidents.

2 SCOPE
This procedure applies to the Orange City Council (OCC) water supply system.

3 PROCEDURE
In the event of water quality incidents PLA220501 Water Quality Incident Management Plan is to be followed.

3.1 NSW Health requirements for reporting drinking water quality incidents
The types of incidents that require reporting are:
1. Detection of *Escherichia coli* (*E. coli*);
2. Detection of a pathogen (e.g. *Cryptosporidium* or *Giardia*);
3. Detection of a physical or chemical parameter exceeding the guideline value in the *Australian Drinking Water Guidelines* (ADWG);
4. Detection of radioactivity exceeding gross alpha and gross beta screening values in the ADWG;
5. Failure to achieve ≥0.2 mg/L chlorine at the last point of primary disinfection before consumers;
6. Treated water turbidity >1 NTU leaving the WTP;
7. Filtered water turbidity >1 NTU from one filter for more than one hour, where the filtered water cannot be diverted to waste; or
8. An event or series of events likely to adversely affect drinking water quality.

3.1.2 Consultation with PHU
Water Treatment Manager/Water and Sewerage Strategic Manager would speak to PHU in the events where the provision of safe water to consumers may be compromised. In discussions with PHU, it may be determined that a boil water alert is to be issued. PLA220501 Water Quality Incident Management Plan is to be followed.

Incidents must be reported by telephone to the local Public Health Unit (PHU) as soon as practicable. This should be followed by an email notification in the format shown in 0.

Public Health Unit contact details are:
Phone: 02) 6339 5601 (Senior Environmental Health Officer)
Mobile: 0428 400 526 (ask for public health officer on-call).

Whilst on the phone, obtain the appropriate e-mail address for the written notification.

3.1.3 Boil water alerts
Should a boil water alert need to be issued, refer to SWI220507 IRP – Boil Water Alert. The Manager of Corporate and Community Relations would deal with any public communications as per SWI220405 Boil Water Alert - Public and Media Communication Strategy.
3.2 OCC internal incident reporting and management process

3.2.1 Complaints
Water quality complaints are received by Customer Service and processed through Council’s Customer Request Management system. These are all delivered to the reticulation section of Council and acted on. This is addressed in SWI220407 Handling Water and Sewer Quality and Supply Complaints and Requests.

3.2.2 Reticulation
The Reticulation crew report to the Works Engineer Water and Sewer any known events which may compromise water quality and any water quality complaints as they occur. The Works Engineer Water and Sewer is to report to the Water and Sewerage Strategic Manager or Water Treatment Manager any scenarios of immediate concern. Remedial action is to be undertaken as required. Refer SWI220501 Water Quality Incident Management Plan as required.

Potable water has the highest priority. However, when responding to water quality complaints consideration also needs to be given to the Ploughmans Valley North Orange (PVNO) dual water supply scheme. Highlighted through the water quality risk assessment process was the issue of potential odour and operational problems which need to be identified as they arise. Additionally, there is also the unlikely chance of a cross connection between the dual water supply scheme and potable water which needs to be identified and managed promptly (such as flushing).

3.2.3 Water Treatment
Operators and Technicians are to report any anomalous results, failures to achieve targets and critical limits (CCPs), unusual field observations, or situations where water quality may be compromised to the Water Treatment Supervisor immediately. Anything outside the norm will be recorded on FRM221323 Field anomalous results (copy attached) which is to be handed to the Supervisor. The Water Treatment Supervisor will report any results of concern immediately to the Water Treatment Manager for the treatment plants. The water treatment team will investigate and rectify as required. SWI220501 Water Quality Incident Management Plan as required.

3.2.4 Incident Investigations
In the event of an incident or an emergency an investigation of the incident or emergency will be undertaken and all staff will be debriefed. This is through SWI221801 Incident Investigation completing FRM221801 Incident Investigation Form and FRM221802 Incident Debrief Report Template. These include corrective actions that are required, responsibility and are signed off by the Manager.

3.2.5 Meetings
Water Quality Meeting: All water quality anomalies or failures are reported at Council’s Water Quality Meeting which is held monthly. This meeting discusses any events, possible causes, what has been done to date, and if further actions or equipment are required. This is a minuted meeting including follow up actions to be undertaken which are assigned to the appropriate staff member. This meeting is attended by the Water Treatment Manager, supervisors and operators involved with water treatment and monitoring. Minutes are distributed to those that attend the meeting.
Water and Sewer Planning Meeting: Issues of concern are also raised at the Water and Sewer Planning Meeting. This meeting is held fortnightly. The meeting discusses any problems throughout Councils systems, including raising items for budget consideration or further development of procedural processes. This is also a minuted meeting including follow up actions to be undertaken which are assigned to the appropriate staff member. This meeting is attended by the Water Treatment Manager, Water and Sewerage Strategic Manager and the Water and Sewer Supervisors involved with water treatment, reticulation and asset management. Minutes are distributed to those that attend the meeting.

Line Managers Meeting: is held weekly and includes all line managers from Technical Services division of Council. Items of interest are raised and include progress updates of various projects, concerns raised, and future works proposed. This meeting is minuted with minutes distributed to those that attend the meeting.

Impromptu meetings: occur during an incident of concern such as through SWI220507 IRP – Boil Water Alert.

3.3 Routine Regulatory Reporting
Council has an obligation to report annually to various regulatory bodies, which includes the reporting of water quality and complaints. This includes:

- NSW Office of Water (Water Management Act 2000) – NSW Water and Sewer Performance reporting. Data is included in the Performance Monitoring Report and NSW Benchmarking Report. This information also feeds into the National Water Initiative. This data is also fed to the Australian Bureau of Statistics for inclusion into the Water Account.
- NSW Environmental Protection Authority (Protection of the Environment Operations Act 1997) – Annual Returns for sites operating under an Environmental Protection Licence.
- Bureau of Meteorology (Water Act 2007) – data feeds into documents such as the National Water Account.

4 CRITICAL CONTROL POINTS (CCP)
N/A

5 QUALITY CONTROL POINTS (QCP)
N/A

6 OPERATING RULES
N/A

7 MONITORING
This procedure may be subject to internal audit and review.

8 MAINTENANCE AND CALIBRATION
N/A
9 REMEDIAL ACTION
N/A

10 DATA MANAGEMENT
N/A

11 REPORTING
N/A

12 RESPONSIBILITIES

| Operations team                  | • Escalate water quality incidents to Supervisors  
|                                 | • Investigate water quality incidents  
|                                 | • Rectify any issues  
| Water Treatment Supervisor, Works Engineer - Water and Sewer | • Escalate water quality incidents to Water Treatment Manager, or Water and Sewerage Strategic Manager  
|                                 | • Investigate water quality incidents  
|                                 | • Ensure any issues are addressed  
| Water Management Officer        | • Ensure routine regulatory reporting is undertaken  
| Water Treatment Manager, or Water and Sewerage Strategic Manager | • Notify and liaise with PHU on water quality incidents, Director Technical Services and Corporate and Community Relations as required.  
|                                 | • Ensure any follow up actions are completed by responsible staff members  

13 REFERENCES
- SWI220507 IRP – Boil Water Alert
- PLA220501 Water Quality Incident Management Plan
- SWI220405 Boil Water Alert - Public and Media Communication Strategy
- SWI220407 Handling Water and Sewer Quality and Supply Complaints and Requests
- SWI221801 Incident Investigation
- FRM221801 Incident Investigation Form
- FRM221802 Incident Debrief Report Template
- FRM221323 Field anomalous result
APPENDIX 1. EXAMPLE EMAIL NOTIFICATION TO NSW HEALTH

To: <local PHU>
CC: Water and Sewerage Strategic Manager, Water Treatment Manager, Water Treatment Supervisor, Water and Sewerage Reticulation Supervisor, Water Management Officer, Water and Sewerage Engineer, Water Treatment Supervisor.
Subject: Drinking Water Quality Incident Report

Email body:

To <local PHU contact>,

This is notification of a drinking water quality incident in the Orange City Council water supply system.

This email follows a notification by telephone that was made on <date and time of phone notification>.

Contact details for following up on incident:
<Contact person>
<Position>
<Telephone number>
<Fax number>
<Mobile number>
<Postal address>
<Email address>

Type of incident:
<List the type of incident, for example: Detection of E. coli; Failure to achieve ≥0.2 mg/L chlorine before consumption>

Sample details: <delete this section if notification is regarding a series of events and NOT a non-conforming sample>
System location: <raw/source water, filtered water, treated water leaving WTP, reticulation>
Sample date and time: <date and time sample was collected>
Sample location: <e.g. OG01-009: 270 McLachlan Street Orange>
Parameter and results: <e.g. E. coli 5 CFU/100mL, Turbidity 2.5 NTU>
Testing laboratory: <testing laboratory>

A follow-up sample <choose one of following>:
- Was collected from the same site on <date and time>, tested by <laboratory>, and found <parameter and results>
  OR
- Was collected from the same site on <date and time> and results from <laboratory> are expected on <date and time>
  OR
- Was collected from <sample site> on <date and time> because the original sample site could not be accessed. Testing by <laboratory> found <parameters and results>
OR

- Was collected from <sample site> on <date and time> because the original sample site could not be accessed. Results from <laboratory> are expected on <date and time>
  OR
- Is scheduled to be collected from the same site on <date and time> and results from <laboratory> are expected on <date and time>
  OR
- Is scheduled to be collected from <sample site> on <date and time> because the original sample site cannot be accessed. Results from <laboratory> are expected on <date and time>

Incident information:
<Description of events that led to the incident (if known), and immediate impact of incident>

Immediate corrective actions:
<e.g. flushing, increase chlorine dosing, change source water; OR Corrective action has not yet been taken – if no action taken, explain why>
**OCM WATER QUALITY MANAGEMENT**

**INCIDENT DEBRIEF REPORT TEMPLATE**

(This form does not replace WHS requirements for reporting incidents)

<table>
<thead>
<tr>
<th>Incident Report No.</th>
<th>No. of pages</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 of</td>
</tr>
</tbody>
</table>

**Event Title:**

**List Of Attendees**

- [ ] <Site Incident Mger>
- [ ] <Site Operations Officer>
- [ ] <Site Communications Officer>
- [ ] <Site Support Officer>
- [ ] EPA / NSW Health

**Date of the Debrief:**

**Event Title:**

**List Of Attendees**

- [ ] <Client>
- [ ] <Head Office>
- [ ] <Other Staff>
- [ ] <WorkCover>

**Date of the Debrief:**

**Category of Incident:**

- [ ] Quality
- [ ] Environment
- [ ] Security
- [ ] Natural Event
- [ ] Operations
- [ ] WHS
- [ ] Commercial
- [ ] Social Event
- [ ] Other

**Level of Incident:**

- [ ] Minor
- [ ] Major

**Detailed Description of Incident**, including overall impact on the site, the personnel, the community…

(attach sheet of paper if required):

**Date of Incident:**

**Time of Incident:**

**Initial Incident Reported By:**

**Position:**

**Summary of Immediate Actions:**

**Impact:**

---

**DEBRIEF**

**Issues and Recommendations:**

**Identified Issue (1):**

**Associated Actions:**

**Issue Owner:**

**Action Owner:**

**Identified Issue (2):**

**Associated Actions:**

**Issue Owner:**

**Action Owner:**

**Incident Investigation required:**

- [ ] Yes
- [ ] No

**If Yes, number:**

**Incident Report closed out:**

- [ ] Yes
- [ ] No

**Date:**

**Time:**

**am/pm**

**Distribution List:**

- [ ] <Site Incident Mger>
- [ ] <Site Operations Officer>
- [ ] <Site Communications Officer>
- [ ] <Site Support Officer>
- [ ] EPA / NSW Health

- [ ] <Client>
- [ ] <Head Office>
- [ ] <Other Staff>
- [ ] <WorkCover>

**Other**

**Attachments:**

- [ ] Time Log
- [ ] Documents
- [ ] Photos
- [ ] Other